The PHOTOFACT Servicer

SET 456 ★ *Published for all users of Howard W. Sams' Photofact Folders* ★ SEPT., 1959

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This Servicer provides you with essential data on other models or special equipment not covered in standard PHOTOFACT folders. The schematics and supplementary data included here will be of valuable help to you in servicing this equipment.

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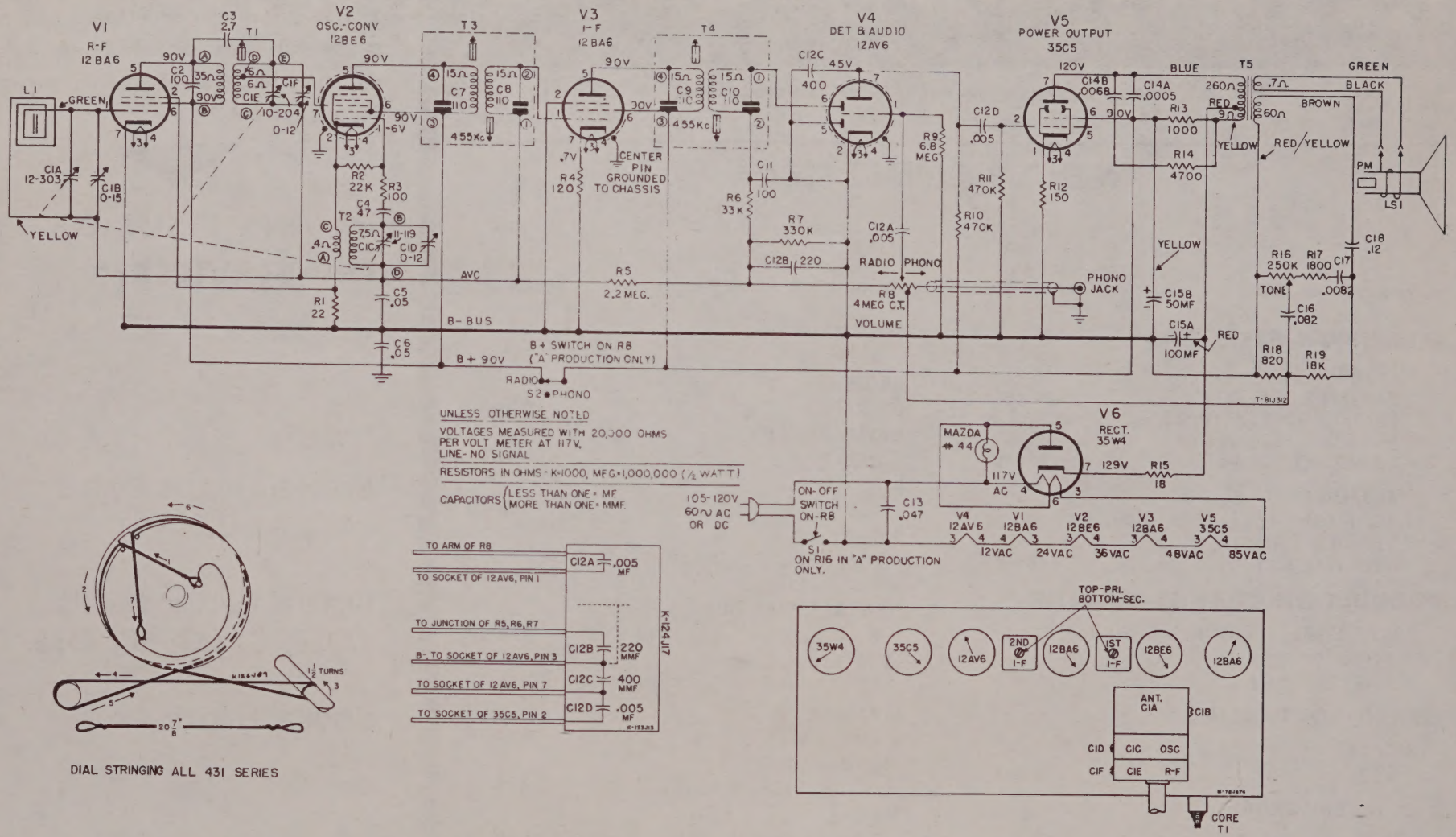
General Electric Model 436

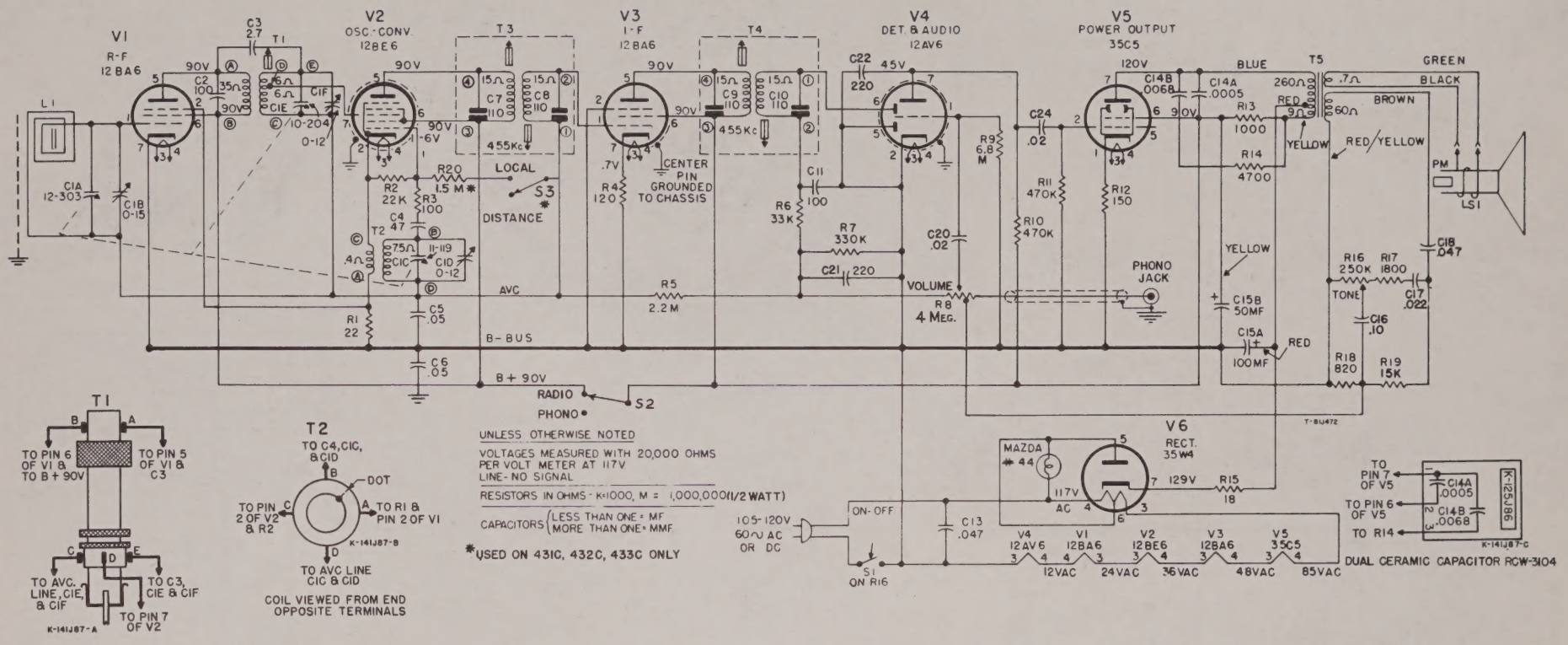


DIAL STRINGING ALL 431 SERIES

TO ARM OF R8
C12A .005 MF
TO SOCKET OF 12AV6, PIN 1
TO JUNCTION OF R5, R6, R7
B+ TO SOCKET OF 12AV6, PIN 3
C12B 220 MMF
TO SOCKET OF 12AV6, PIN 7
C12C 400 MMF
TO SOCKET OF 35C5, PIN 2
C12D .005 MF
K-124J17

GENERAL ELECTRIC MODELS 431, A, 432, A

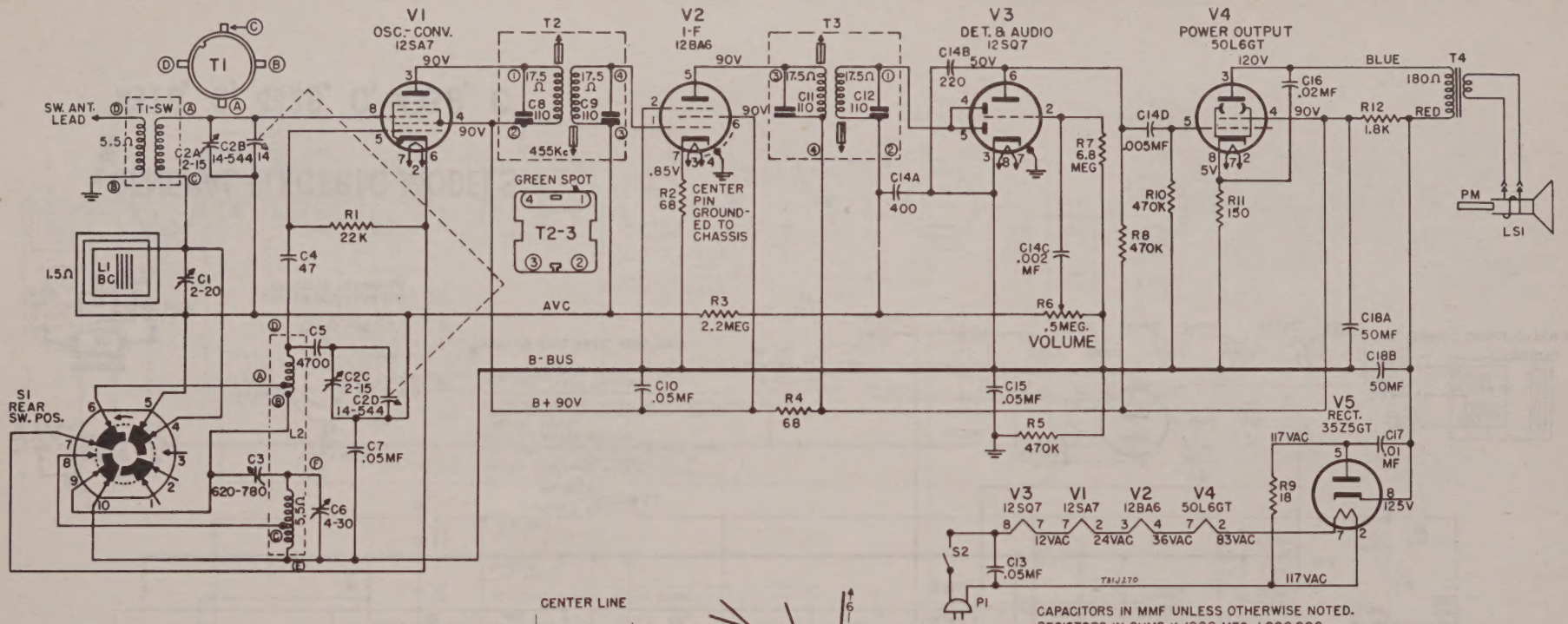
Schematic Diagram Courtesy of General Electric Co.



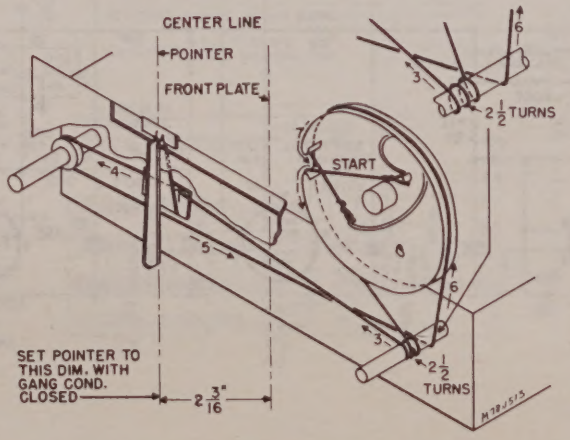
GENERAL ELECTRIC MODELS

431B, C, 432B, C, 433B, C

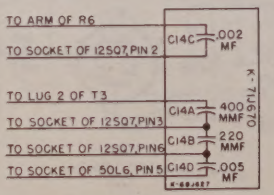
Schematic Diagram Courtesy of General Electric Co.



CAPACITORS IN MMF UNLESS OTHERWISE NOTED.
RESISTORS IN OHMS, K=1000, MEG.=1,000,000.
VOLTS MEASURED AT 117V. A.C. LINE, 20,000Ω/V. METER WITH RESPECT TO B-. TUNING COND. CLOSED, VOLUME CONTROL AT MINIMUM.



DIAL STRINGING DIAGRAM


TO ARM OF R6
TO SOCKET OF 12SQ7, PIN 2
C14C .002 MF
TO LUG 2 OF T3
TO SOCKET OF 12SQ7, PIN 3
C14A 400 MMF
TO SOCKET OF 12SQ7, PIN 6
C14B 220 MMF
TO SOCKET OF 50L6, PIN 5
C14D .005 MF
K-71670

BULLPLATE

GENERAL ELECTRIC MODEL 436

Schematic Diagram Courtesy of General Electric Co.

PHOTOFACT* Folder with CIRCUITRACE*

ADMIRAL MODELS PA17F1, 2, 3, P17F1, 2, 3, PS17F12, 13, 22, 22D, 23, 23D, (Ch. 15A2, 15B2, 15B3D, 15UA2, 4G3, D, 4H3,)

IMPORTANT FILING NOTICE

The TV Folder for this envelope will be found among the first folders in this complete Set of folders.

Merely insert the corresponding folder on this model in this envelope to retain proper filing and indexing order.

ADMIRAL MODELS PA17F1, 2, 3, P17F1, 2, 3, PS17F12, 13, 22, 22D, 23, 23D, (Ch. 15A2, 15B2, 15B3D, 15UA2, 4G3, D, 4H3,)

ADMIRAL MODELS PA17F1, 2, 3, P17F1, 2, 3, PS17F12, 13, 22, 22D, 23, 23D, (Ch. 15A2, 15B2, 15B3D, 15UA2, 4G3, D, 4H3,)

MODEL PS17F22 (Ch. 15B3, 4G3)

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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SET 456 FOLDER 1

PHOTOFACT* Folder with CIRCUITRACE*

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

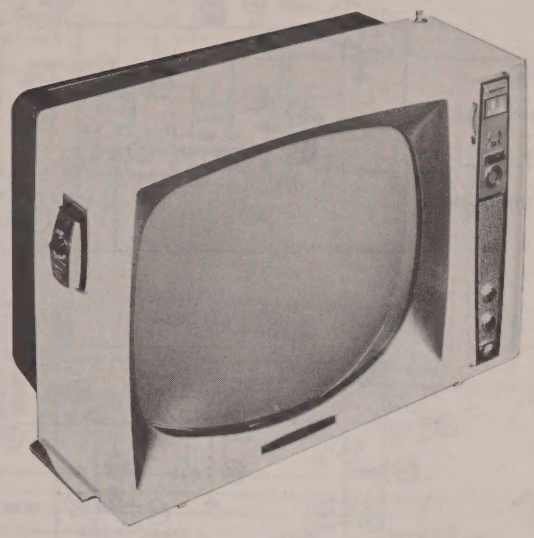
ADMIRAL MODELS PA17F1, 2, 3, P17F1, 2, 3, PS17F12, 13, 22, 22D, 23, 23D, (Ch. 15A2, 15B2, 15B3D, 15UA2, 4G3, D, 4H3,)

ADMIRAL MODELS PA17F1, 2, 3, P17F1, 2, 3, PS17F12, 13, 22, 22D, 23, 23D, (Ch. 15A2, 15B2, 15B3D, 15UA2, 4G3, D, 4H3,)

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 11 metal screws holding rear cover. Remove 2 screws holding antenna terminal board. Remove rear cover.
2. Remove 3 push-on type knobs from front. Pull front escutcheon straight out to remove. Remove 2 remaining push-on type knobs.
3. Remove 2 screws holding microphone to front panel.
4. Remove picture tube socket, yoke and the picture tube grounding spring near tuner.
5. Remove 4 chassis bolts from rear of cabinet and 6 chassis bolts from bottom of cabinet.
6. Move chassis away from picture tube on right side so that the HV lead can be disconnected.
7. Remove the chassis.



MODEL PS17F22 (Ch. 15B3, 4G3)

CAUTION

ONE SIDE OF AC LINE CONNECTED TO CHASSIS.

Care should be exercised when connecting test equipment or physically contacting chassis. Isolation devices employed by manufacturer should be checked and properly connected before returning receiver to owner.

TRADE NAME	Admiral	MODELS	CHASSIS	MODELS	CHASSIS
		P17F1, P17F2, P17F3	15A2	PS17F22, PS17F23	15B3
		PA17F1, PA17F2, PA17F3	15AU2	Remote Control	4G3
		PS17F12, PS17F13	15B2	PS17F22D, PS17F23D	15B3D
		Remote Control	4H3	Remote Control	4G3D

MANUFACTURER Admiral Corp., 3800 W. Cortland St., Chicago 47, Illinois
TYPE SET Television Receiver With Remote Control
TUBES TV: VHF-Fourteen, UHF-Fifteen, Remote Control: Four
POWER SUPPLY 110-120 Volts AC, 60 Cycle RATING TV with Remote Control 170 Watts, 1.6 Amp. @ 117 Volts AC While Tuning 210 Watts, 2 Amp. @ 117 Volts AC
TUNING RANGE Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF, 41.25MC (Intercarrier)

SERVICING IN THE FIELD

SAFETY GLASS REMOVAL

For picture tube, and safety glass cleaning, it is necessary to remove the chassis. (See "Disassembly Instructions".)

FUSE DEVICE

A Circuit Breaker is used for low voltage power supply protection, and may be reset by depressing the reset button. (For location, see "Tube Placement Chart".)

TUNER OSCILLATOR ADJUSTMENTS

To touch-up the VHF Oscillator remove the Off-On-Volume, Contrast and Vert. Hold knobs. Remove front escutcheon. Remove Channel Indicator and Fine Tuning knobs.

AGC

The AGC may be varied by means of an AGC control. (For location, see "Tube Placement Chart".)

FOCUS

The focus may be varied by connecting the lead from pin 4 of the picture tube to various voltage points. (For location, see photo "Cabinet-Rear View".)

HORIZONTAL OSCILLATOR FIELD ADJUSTMENTS

The Horizontal Frequency slug is used for the Horizontal Hold. (For location, see "Tube Placement Chart".)

CENTERING

Centering is accomplished by 2 magnetic rings, located behind the yoke, on the neck of the picture tube.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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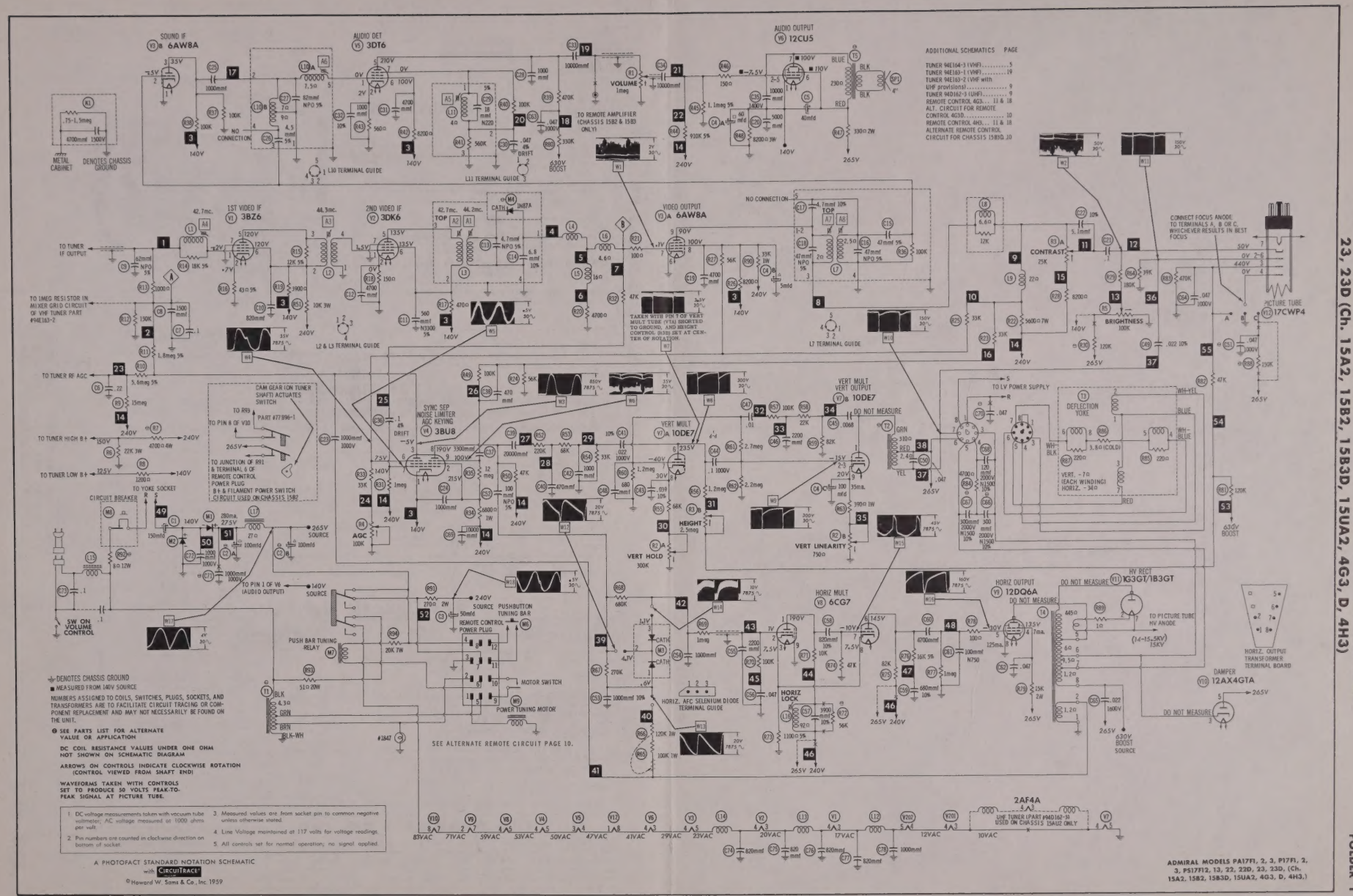
JA443

SET 456 FOLDER 1


SOUND IF V3 6AW8A
AUDIO DET V5 3DT6
AUDIO OUTPUT V6 12CU5
1ST VIDEO IF V1 3BZ6
2ND VIDEO IF V2 3DK6
VIDEO OUTPUT V3A 6AW8A
SYNC SEP NOISE LIMITER AGC KEYING V4 3BU8
VERT MULT V7A 10DE7
VERT MULT VERT OUTPUT V7B 10DE7
HORIZ MULT V8 6CG7
HORIZ OUTPUT V9 12DQ6A
HV RECT V11 1G3GT/1B3GT
DAMPER V10 12AX4GTA
2AF4A
PICTURE TUBE V12 17CWP4
ADDITIONAL SCHEMATICS PAGE
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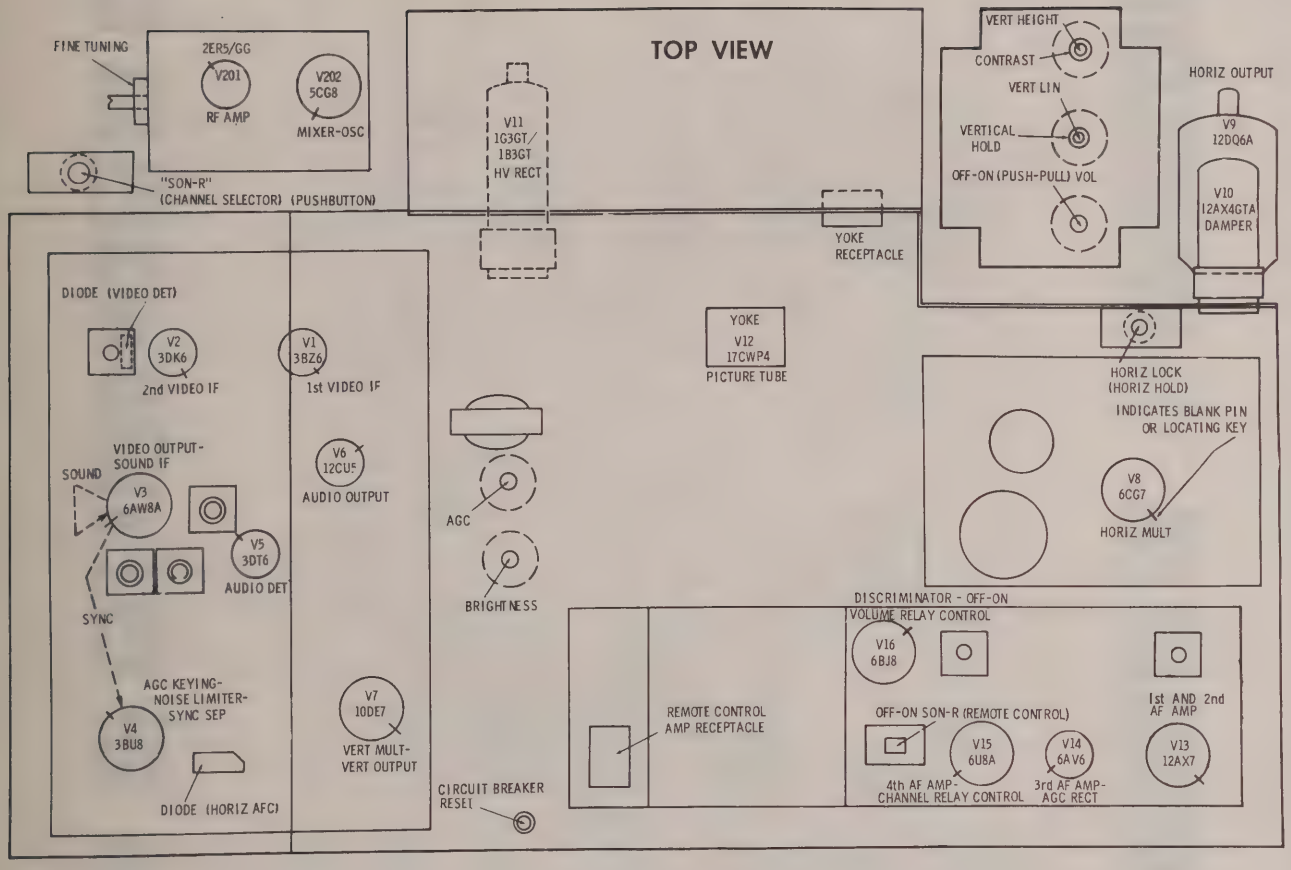
TUNER 94E163-2 (VHF with UHF provision) 9
TUNER 94D162-3 (UHF) 9
REMOTE CONTROL 4G3 ..... 11 & 18
ALT. CIRCUIT FOR REMOTE CONTROL 4G3D 10
REMOTE CONTROL 4H3 ..... 11 & 18
ALTERNATE REMOTE CONTROL CIRCUIT FOR CHASSIS 15B3D ..10
DENOTES CHASSIS GROUND
MEASURED FROM 140V SOURCE
NUMBERS ASSIGNED TO COILS, SWITCHES, PLUGS, SOCKETS, AND TRANSFORMERS ARE TO FACILITATE CIRCUIT TRACING OR COMPONENT REPLACEMENT AND MAY NOT NECESSARILY BE FOUND ON THE UNIT.
SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM
ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)
WAVEFORMS TAKEN WITH CONTROLS SET TO PRODUCE 50 VOLTS PEAK-TO-PEAK SIGNAL AT PICTURE TUBE.
1. DC voltage measurements taken with vacuum tube voltmeter; AC voltage measured at 1000 ohms per volt.
2. Pin numbers are counted in clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line Voltage maintained at 117 volts for voltage readings.
5. All controls set for normal operation; no signal applied.
A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE
©Howard W. Sams & Co., Inc. 1959
ADMIRAL MODELS PA17F1, 2, 3, P17F1, 2, 3, PS17F12, 13, 22, 22D, 23, 23D, (Ch. 15A2, 15B2, 15B3D, 15UA2, 4G3, D, 4H3.)

TUBE PLACEMENT CHART



ADMIRAL MODELS PA17F1, 2, 3, P17F1, 2, 3, PS17F12, 13, 22, 22D, 23, 23D, (Ch. 15A2, 15B2, 15B3D, 15UA2, 4G3, D, 4H3.)

TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce indicated symptoms. Refer to tube placement chart for location and type of tube.

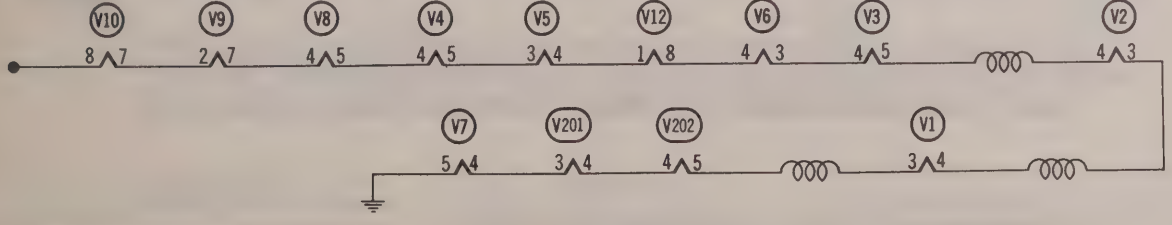
POWER SUPPLY FAILURE
No raster, no sound Circuit Breaker, Rectifiers (B+)

SWEEP FAILURE
No raster, has sound V8, V9, V10, V11, V12, Rectifiers (B+)
No vertical deflection V7
Poor vert. linearity or foldover V7
Poor horiz. linearity or foldover V8, V9, V10
Narrow picture V8, V9, V10, Rectifiers (B+)
Vert. off freq. V7
Horiz. off freq. Diode (Horiz. AFC), V8, V9

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster V1, V2, Diode (Video Det), V3
No pic, no sound, has snow V201, V202
No pic, has sound, has raster V3, V12
Has pic, no sound V3, V5, V6
Overloaded picture V4

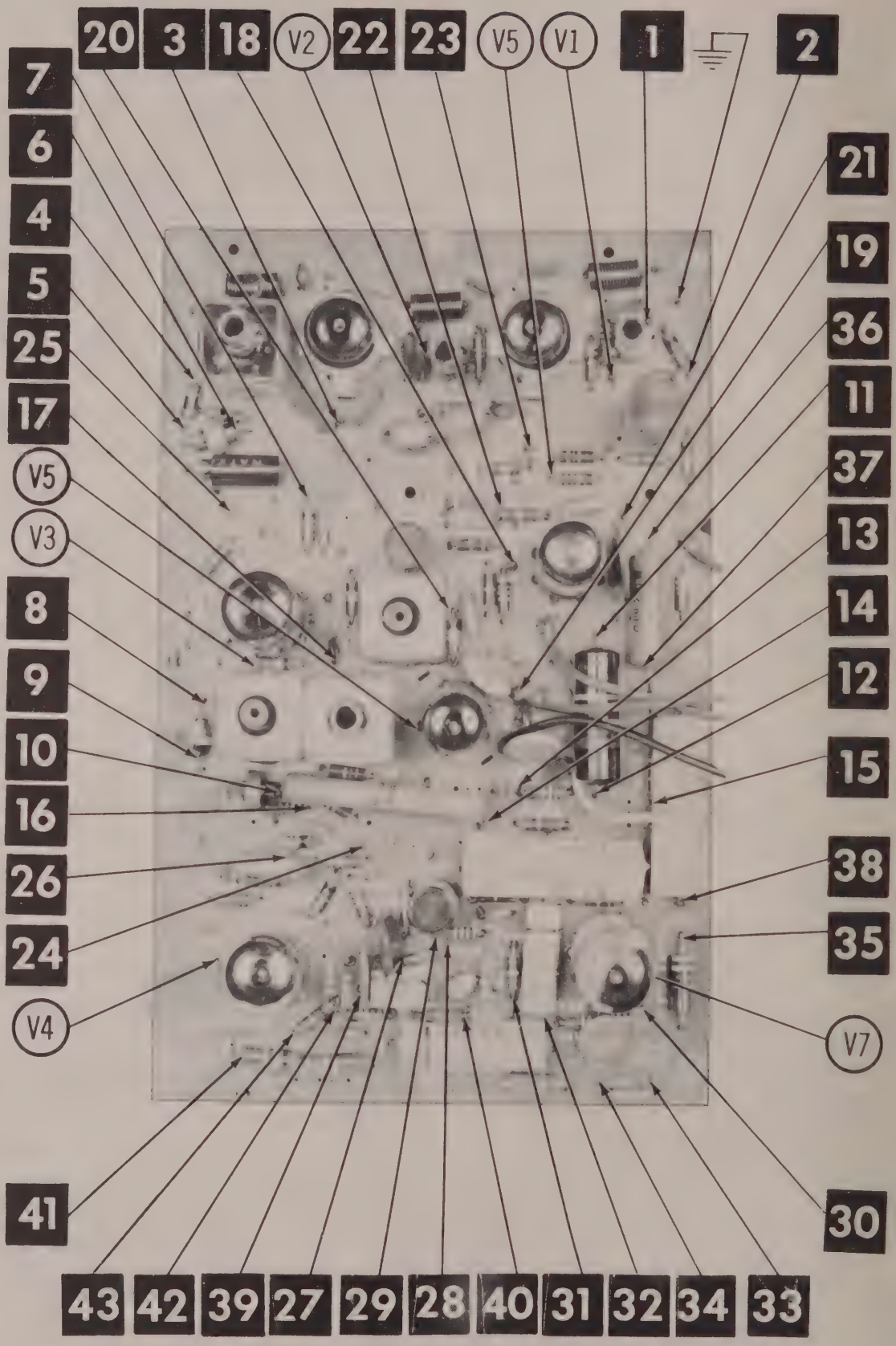
SYNC FAILURE
No vert. sync V7
No horiz. sync Diode (Horiz. AFC), V8
No vert. or horiz. sync V4

This receiver employs tubes used in a series filament network, an open filament in any tube will cause the set to be inoperative. (See circuit below.)



FOLDER 1

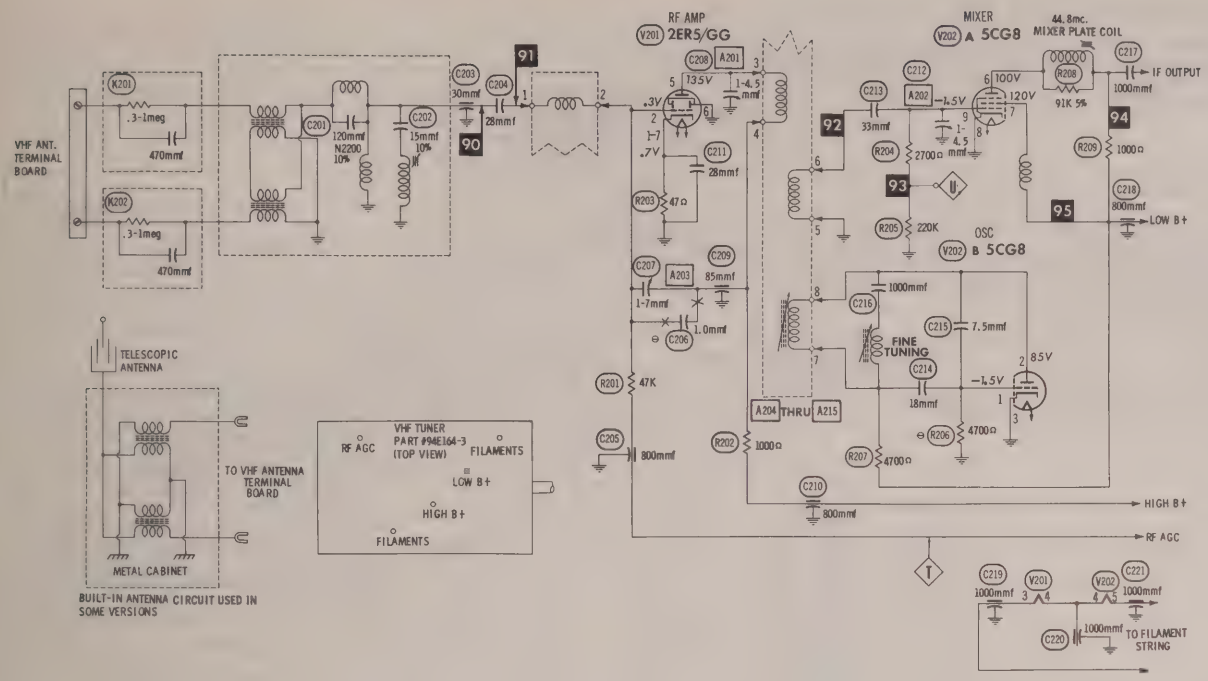
CircuiTrace Numbers 1 thru 43



A Howard W. Sams CIRCUITRACE Photo

MAIN
PRINTED BOARD

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE®

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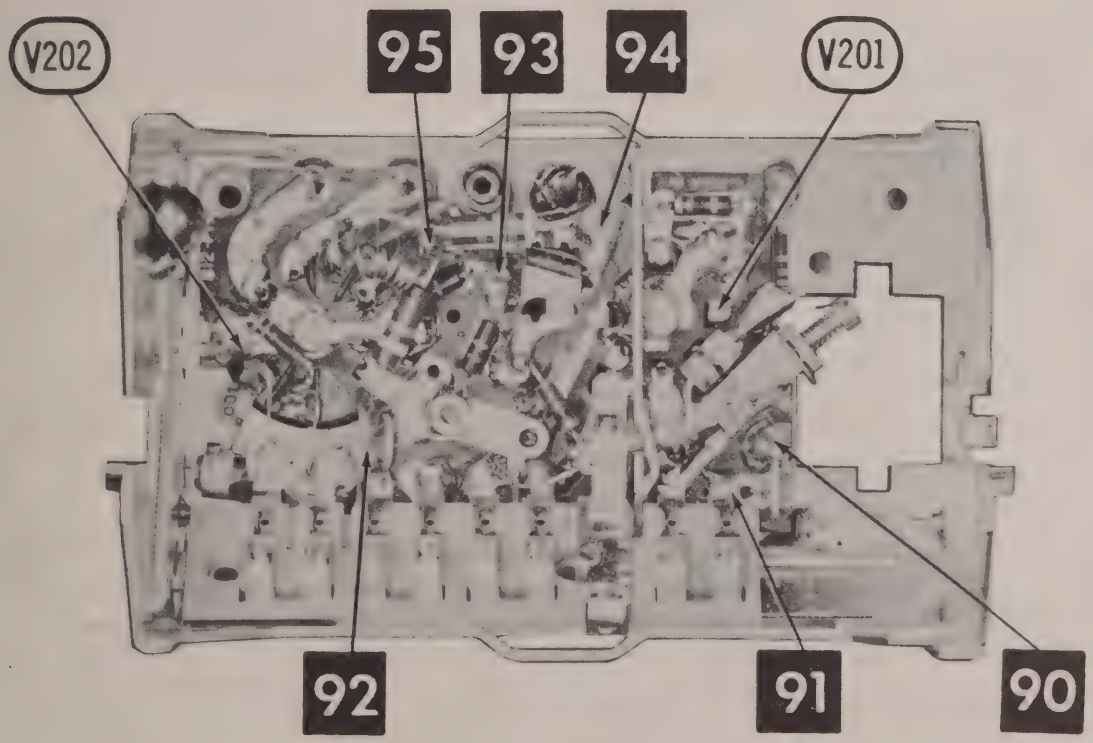
VHF TUNER 94E164-3

CircuiTrace Numbers 90 thru 95



A Howard W. Sams CIRCUITRACE® Photo

TUNER 94E164-3

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED

SET 456 FOLDER 1

TUNER ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS FOR TUNER 94E164-3

Use an ISOLATION TRANSFORMER TO PROTECT the Test Equipment.
The High Voltage lead should be securely taped and kept away from the chassis.
Allow a 20 minute warm-up period for the receiver and test equipment.
Suggested Alignment Tools: A201 thru A203 ..... GENERAL CEMENT #5000, 5003, 5014, 5015, 5016, 8276, 8290
WALSCO #2512, 2515, 2522, 2523, 2525, 2537
A204 thru A215 ..... GENERAL CEMENT #5009, 8195, 8274, 8275, 8728, 8987
WALSCO #2531

RF AND MIXER ALIGNMENT

Connect the negative lead of a 4 volt bias supply to point Ⓓ . Positive to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Use only enough sweep generator output to provide a usable pattern on scope.
Use 10MC sweep unless otherwise noted.
Turn Contrast fully clockwise.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	195MC	193.25MC 197.75MC	10	Vert. Amp. to point Ⓓ Low side to chassis.	A201, A202, A203	Adjust A201 and A202 for maximum amplitude and symmetry with markers as shown in Fig. 201. Increase bias for MINIMUM amplitude of response curve. Without changing the bias adjust A203 to obtain MINIMUM response on the scope.
2.	"	"	213MC	211.25MC 215.75MC	13	"		Check for response curve similar to Fig. 201. If markers fall below 70% on any channel, make compromise adjustment of A201 and A202 with channel switch set to that channel. Check to see that other channels have not been seriously affected.
			207MC	205.25MC 209.75MC	12			
			201MC	199.25MC 203.75MC	11			
			195MC	193.25MC 197.75MC	10			
			189MC	187.25MC 191.75MC	9			
			183MC	181.25MC 185.75MC	8			
			177MC	175.25MC 179.75MC	7			
			85MC	83.25MC 87.75MC	6			
			79MC	77.25MC 81.75MC	5			
			69MC	67.25MC 71.75MC	4			
			63MC	61.25MC 65.75MC	3			
			57MC	55.25MC 59.75MC	2			

FIG. 201

OSCILLATOR ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the Fine Tuning to the center of its range.
Use only enough sweep generator output to provide a usable pattern on scope.
Use 10MC sweep unless otherwise noted.
Connect variable bias to IF AGC line. Adjust bias to obtain response curve which shows no indication of overloading.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
3.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC	211.25MC 215.75MC	13	Vert. Amp. thru 10K across Video Det. load.	A204	Adjust to place sound marker in trap notch as in Fig. 202. Video marker should fall at 50%.
			207MC	205.25MC 209.75MC	12		A205	
			201MC	199.25MC 203.75MC	11		A206	
			195MC	193.25MC 197.75MC	10		A207	
			189MC	187.25MC 191.75MC	9		A208	
			183MC	181.25MC 185.75MC	8		A209	
			177MC	175.25MC 179.75MC	7		A210	
			85MC	83.25MC 87.75MC	6		A211	
			79MC	77.25MC 81.75MC	5		A212	
			69MC	67.25MC 71.75MC	4		A213	
			63MC	61.25MC 65.75MC	3		A214	
			57MC	55.25MC 59.75MC	2		A215	

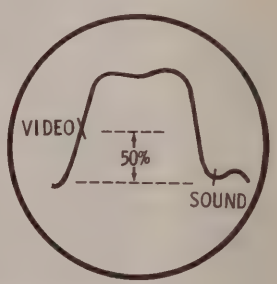


FIG. 202

ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

Use an ISOLATION TRANSFORMER TO PROTECT the Test Equipment.
The High Voltage lead should be securely taped and kept away from the chassis.
Allow a 20 minute warm-up period for the receiver and test equipment.
Suggested Alignment Tools: A1 thru A8.....GENERAL CEMENT #8606, 8606L, 8282, 9295
WALSCO #2526, 2543, 2544, 2545
Mixer Plate Coil. GENERAL CEMENT #9296, 9297
WALSCO #2546, 2547

VIDEO IF ALIGNMENT

Connect the negative lead of a variable bias supply to point (A). Positive to chassis. Adjust bias to obtain response curve which shows no indication of overload.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection. The generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Use only enough sweep generator output to provide a usable pattern on scope.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	High side to ungrounded tube shield floating over Mixer-Osc. tube (V202). Low side to chassis.	Not used	44.2MC (Unmod)	Any non-interfering channel	USE VTVM. DC probe thru 47K to point (B). Common to chassis. (Across Video Det. load)	A1	Adjust for maximum deflection.
2.	"	"	"	42.7MC	"	"	A2	"
3.	"	"	"	44.3MC	"	"	A3	"
4.	"	"	"	42.7MC	"	"	A4	"
5.	"	"	"	44.8MC	"	"	Mixer Plate Coil	"
6.	"	"	44.0MC (10MC Swp)	42.25MC 45.75MC	"	Vert. Amp. thru 47K to point (B). Low side to chassis. (Across Video Det. load.)		Check for response similar to Fig. 1. If necessary, retouch SLIGHTLY A1 thru A4 and Mixer Plate Coil for desired response.

SOUND IF ALIGNMENT

Tune in a strong TV signal. Adjust controls for normal operation.
Turn A5 slowly clockwise until a buzz is heard in the sound. Turn counterclockwise for maximum undistorted sound. Reduce the signal at the antenna terminals (by use of an adjustable attenuator or disconnecting the antenna) until a strong hiss similar to super-regeneration is heard in the sound.
Carefully adjust A6 for maximum undistorted sound with MINIMUM hiss. If the hiss disappears during alignment, further reduce the signal until the hiss returns and retouch A6.
Carefully adjust A7 for MINIMUM 4.5MC beat interference in the picture. 4.5MC beat appears as a very fine crosshatch pattern on the screen. Carefully adjust A8 for maximum undistorted sound with MINIMUM hiss. If the hiss disappears, reduce the signal until the hiss returns and retouch A8.

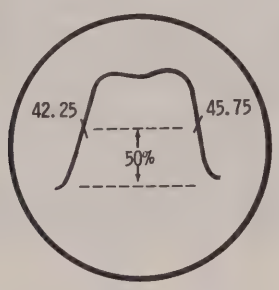


FIG. 1

TUNERS #94E163-1, 94E163-2

VHF OSCILLATOR ALIGNMENT

The individual channel adjustment screws are accessible one at a time, thru a hole in the front of the tuner, as the Channel Selector is rotated. Set the Fine Tuning to the center of its range and switch to channel to be adjusted and adjust for best picture and sound.

VHF RF AND MIXER ALIGNMENT

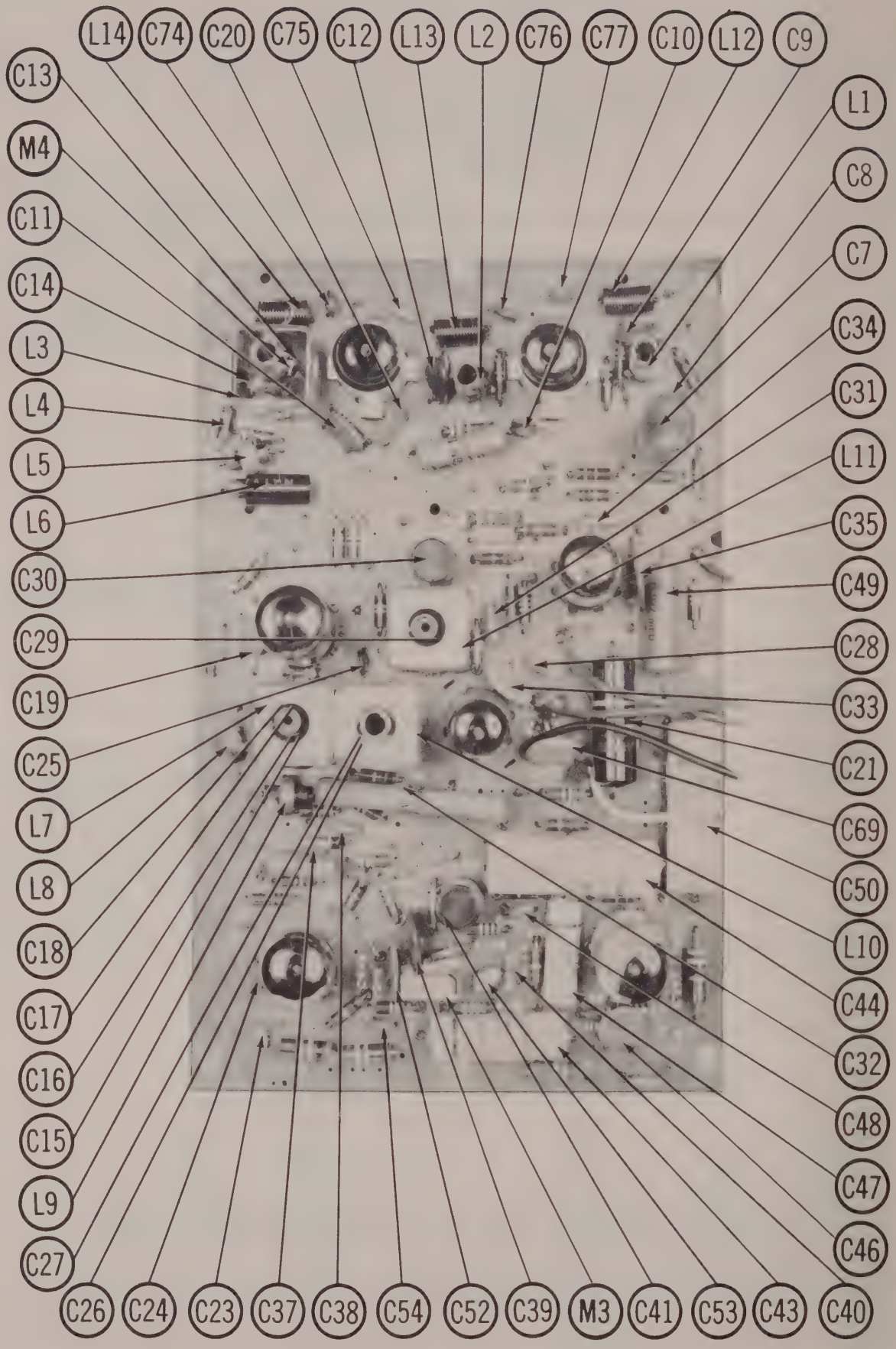
This portion of the tuner has been properly aligned at the factory and is very stable. Alignment of this portion should not be attempted in the field.

UHF TUNER ALIGNMENT

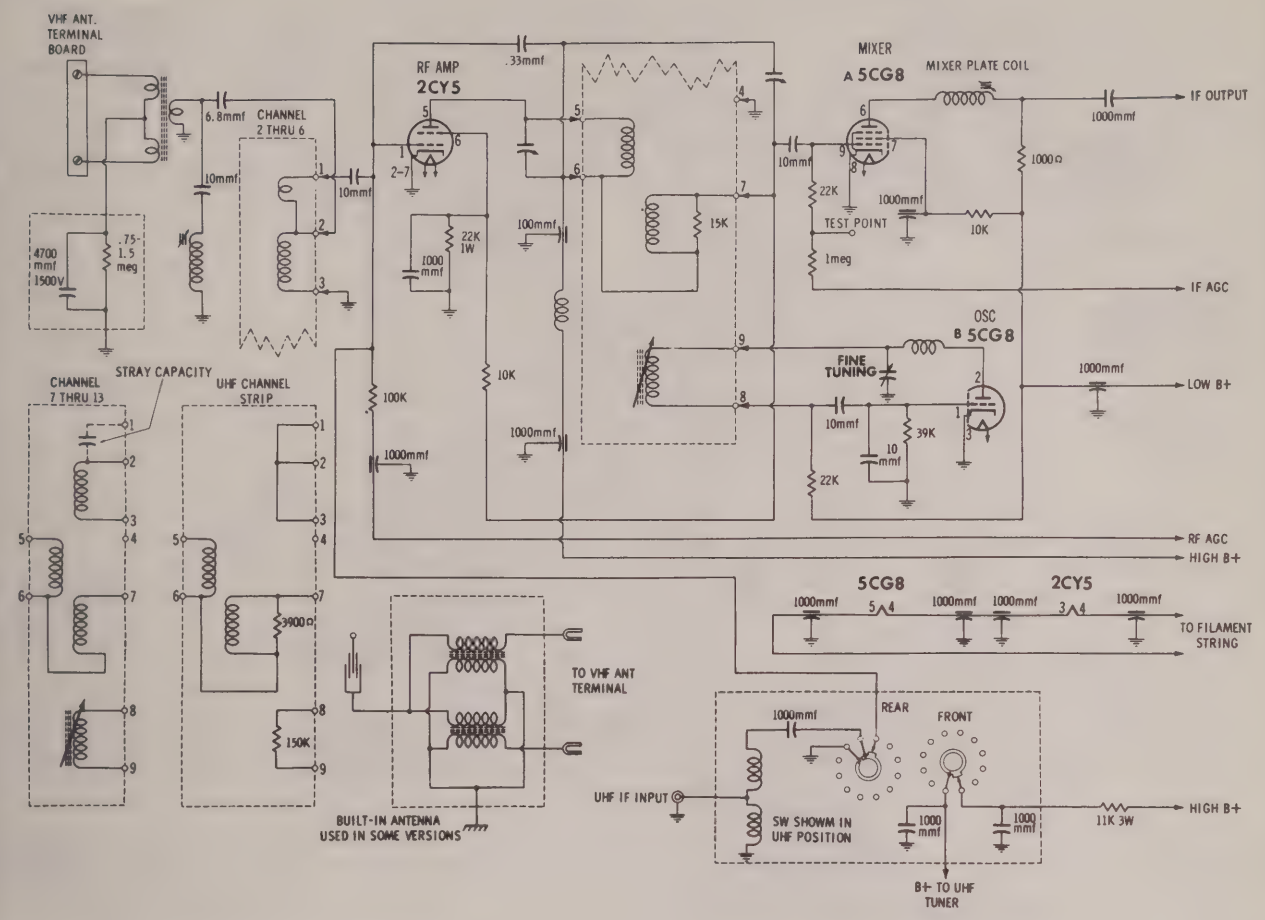
This portion of the tuner has been properly aligned at the factory and is very stable. Alignment of this portion should not be attempted in the field.

ADMIRAL MODELS PA17F1, 2, 3, P17F1, 2, 3, PS17F12, 13, 22, 22D, 23, 23D, (Ch. 15A2, 15B2, 15B3D, 15UA2, 4G3, D, 4H3,)

FOLDER 1



MAIN PRINTED BOARD - CAPACITOR, INDUCTOR IDENTIFICATION



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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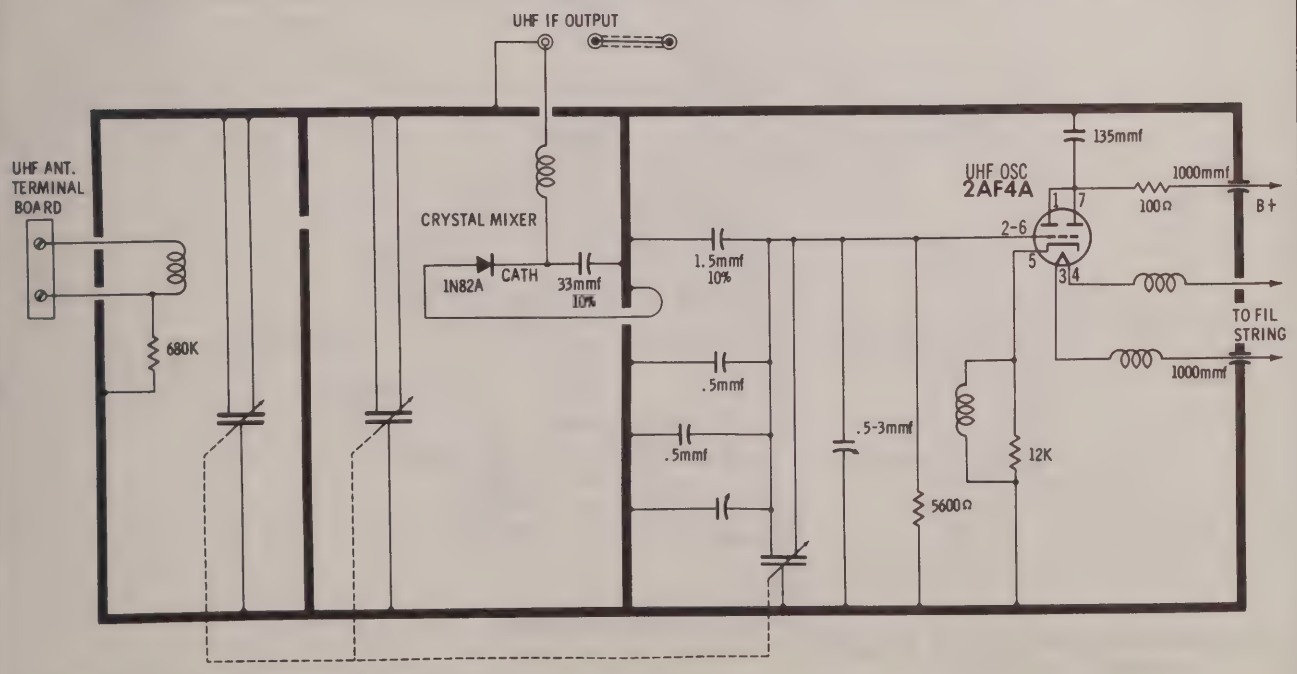
VHF TUNER with UHF provisions 94E163-2



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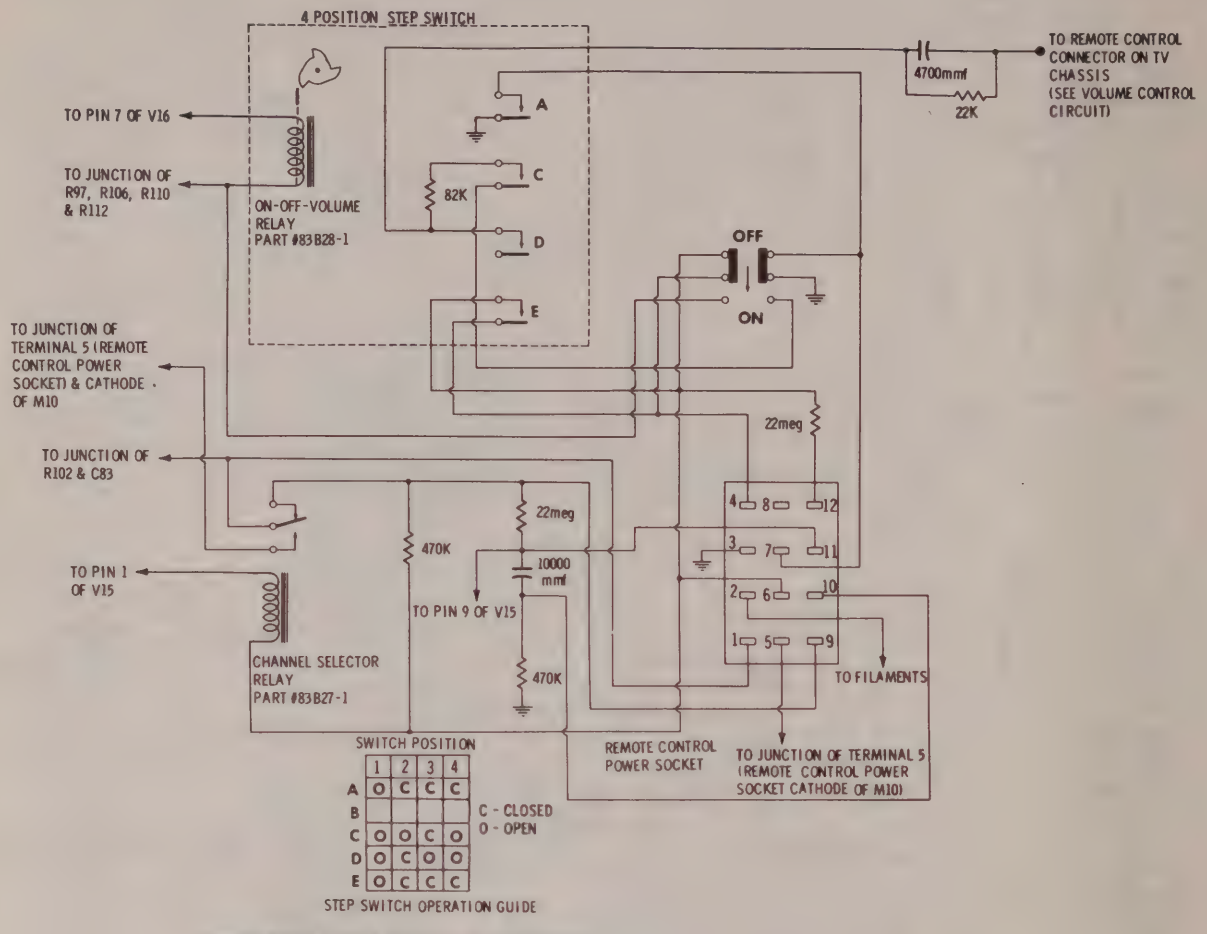
UHF TUNER 94D162-3



ALTERNATE REMOTE CONTROL SWITCH & RELAY CIRCUITRY

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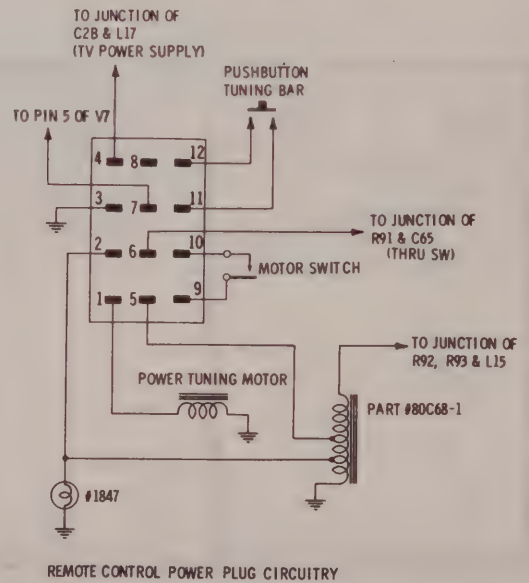
ALTERNATE CIRCUIT REMOTE 4G3D


TO JUNCTION OF C2B & L17 (TV POWER SUPPLY)
PUSHBUTTON TUNING BAR
TO PIN 5 OF V7
TO JUNCTION OF R91 & C65 (THRU SW)
MOTOR SWITCH
TO JUNCTION OF R92, R93 & L15
POWER TUNING MOTOR
PART #80C68-1
#1847

REMOTE CONTROL POWER PLUG CIRCUITRY

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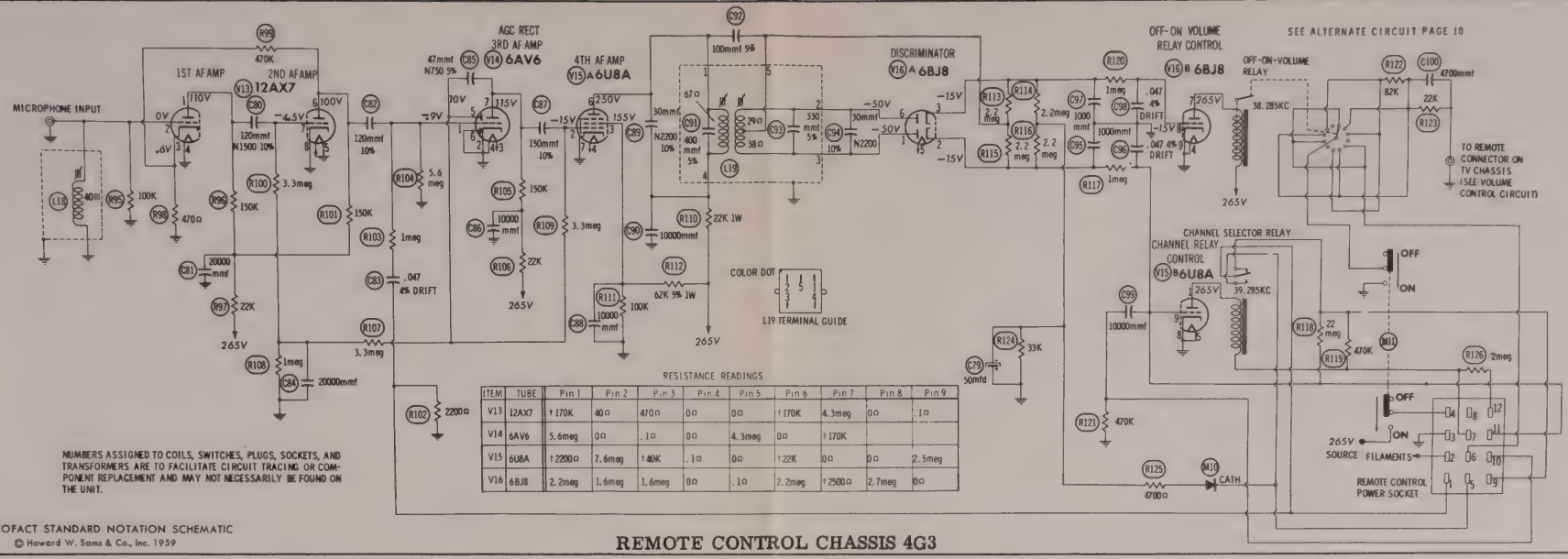
ALTERNATE REMOTE CIRCUIT CH. 15B3D



ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V13	12AX7	↑170K	40Ω	470Ω	0Ω	0Ω	↑170K	4.3meg	0Ω	.1Ω
V14	6AV6	5.6meg	0Ω	.1Ω	0Ω	0Ω	4.3meg	0Ω	↑170K	
V15	6U8A	↑2200Ω	7.6meg	↑40K	.1Ω	0Ω	0Ω	↑22K	0Ω	0Ω	2.5meg
V16	6BJ8	2.2meg	1.6meg	1.6meg	0Ω	.1Ω	2.2meg	↑2500Ω	2.7meg	0Ω

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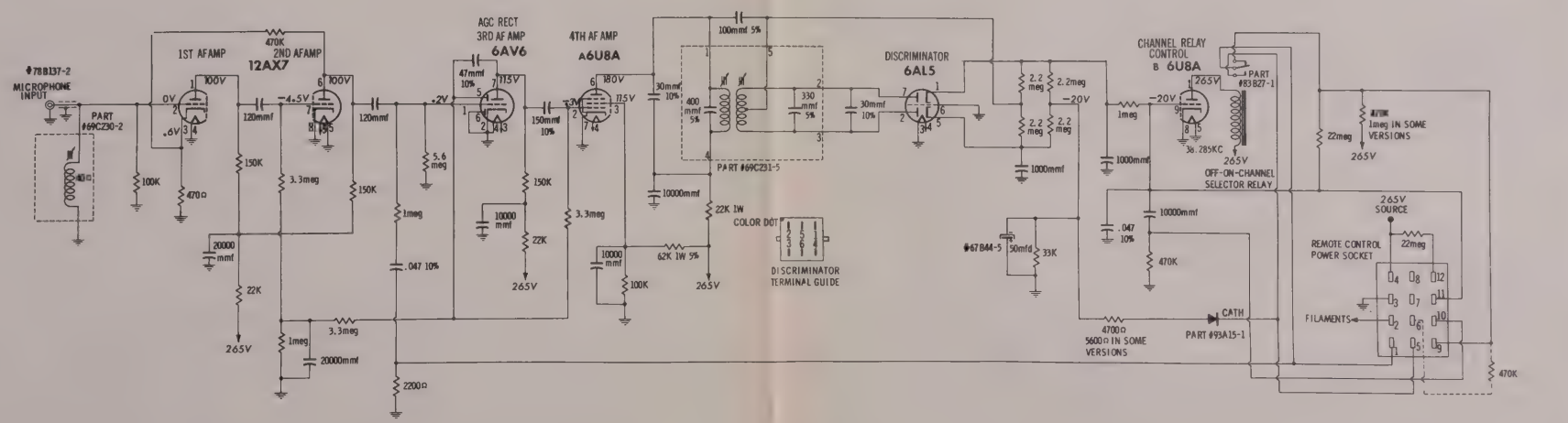
REMOTE CONTROL CHASSIS 4G3



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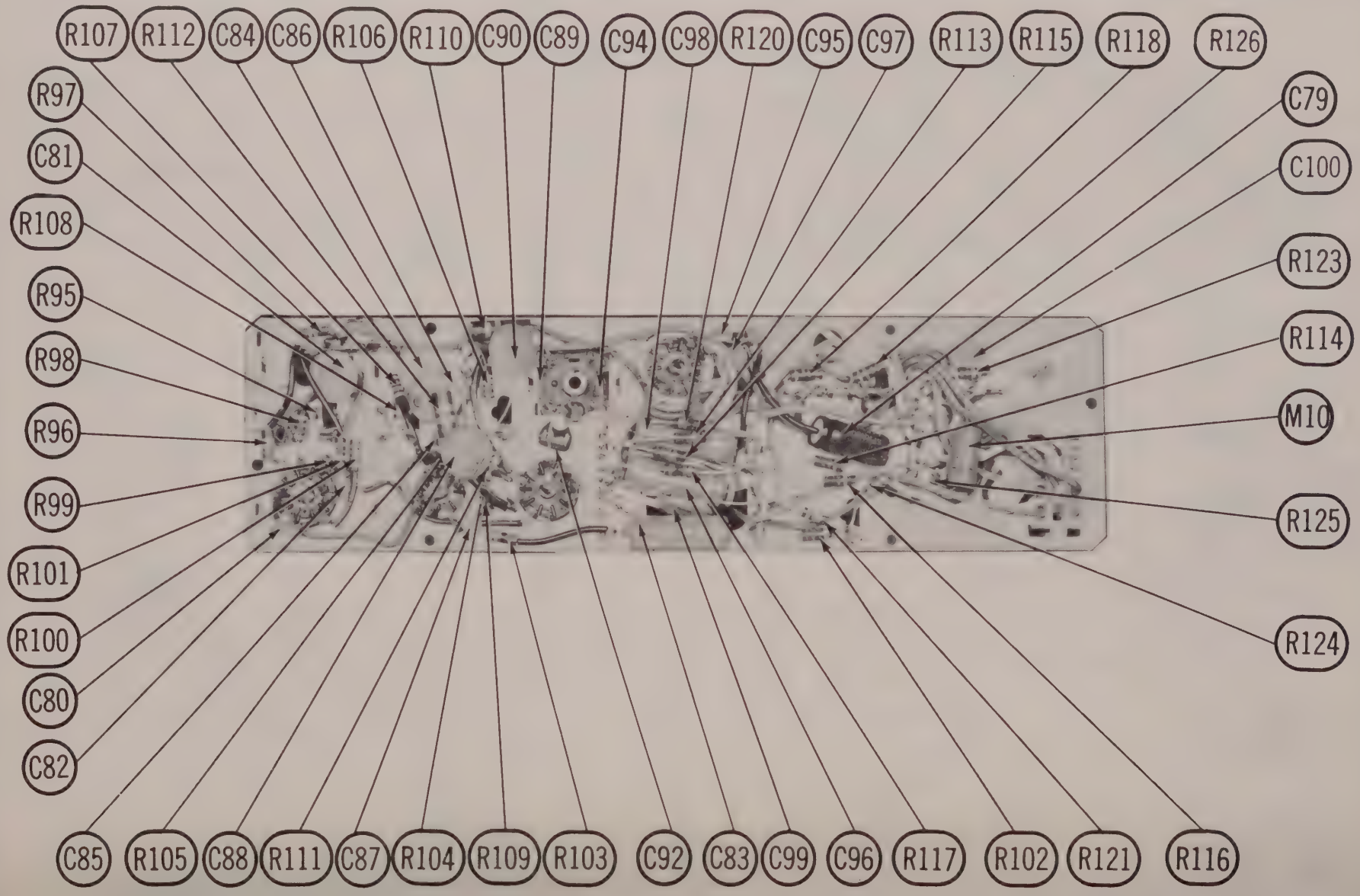
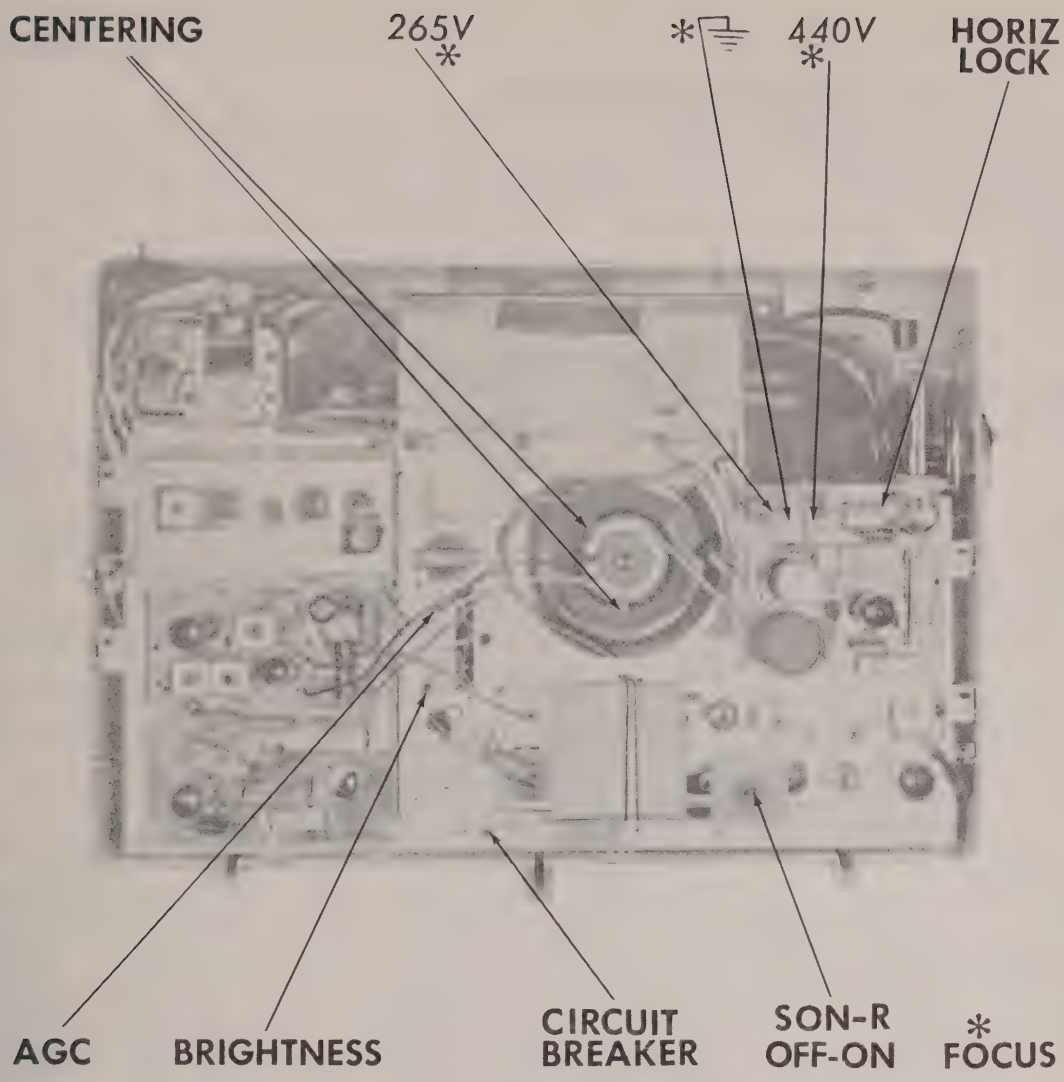
REMOTE CONTROL CHASSIS 4H3



CHASSIS 4G3 BOTTOM VIEW



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably with a test pattern.

Set the Brightness and Contrast controls for a normal picture.

Turn the Horizontal Lock clockwise until the picture loses sync. It may be necessary to switch off channel and back again for picture to lose sync.

Turn the Horizontal Lock slowly counterclockwise until the picture just falls into sync.

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No	USE	TYPE	NOTES
V1	1st Video IF Amp	3BZ6	
V2	2nd Video IF Amp.	3DK6	
V3	Video Output - Sound IF Amp.	6AW8A	
V4	AGC Keying - Noise Limiter - Sync Sep	3BU8	
V5	Audio Det	3DT6	
V6	Audio Output	12CU5	
V7	Vert. Mult. - Vert. Output	10DE7	
V8	Horiz. Mult.	6CG7	
V9	Horiz. Output	12DQ6A	
V10	Damper	12AX4GTA	
V11	HV Rect	1G3GT/ 1B3GT	

PICTURE TUBE

ITEM No	REPLACEMENT DATA				NOTES
	ADMIRAL PART No.	GENERAL ELECTRIC PART No.	RCA PART No.	SYLVANIA PART No.	
V12	17CWP4			17CWP4 Ⅰ	Ⅰ Silver Screen "BS"

ELECTROLYTIC CAPACITORS

ITEM No	RATING CAP	VOLT	REPLACEMENT DATA ADMIRAL PART No.	AEROVOX PART No.	CORNELL DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1	150	200	67D30-47	PWH1-25-75	XA0315 ⚲	FFP123		PCL-1473	
C2A	▲100	400	67D15-335		B0532	FP227.7		TVLS-2678.5	①
B	▲100	400							
C3	50	350	67D30-8		A0390 ⚲	FFP178.5		PCLS-1622*	
C4A	■80	200	67D15-332		B0676			TVL-3467	
B	▲5	200			BR835			TVA-1310	
C	100	50							
C5	40	200	67A25-2	PRS1580	BR4025	TC58	TD-50-450	TVA-1511	

⚲ Use printed circuit adaptor #55277 and 55276.
① Ch. 15A2, 15UA3 used 100mfd ⓖ 350V, & 100mfd ⓖ 350V in this application (Part #67D15-331).
* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	VOLT	TOL	REPLACEMENT DATA ADMIRAL PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C6	.22	200		64S8-37	P288N-22		CUB2P22	GEM-2022	2TM-P22	
C7	.1	100		64A12-2	P25IN-1	DF-104	BC5PL2	ACE-401	3SE-P10	
C8	1500			65D10-103	BPD-0015	DD-152	BYA10D15	B-215	10TS-D15	
C9	62		NPO 5%	65D10-187		TCZ-62	C10Q62C	CNO-462		
C10	820			65D10-91	DI-820	DD-821	BYA10T82	B-382	10TS-T82	
C11	560		N3300 5%	65D10-159						
C12	4700			65D10-112	BPD-0047	DD-472	BYA10D47	B-247	10TS-D47	
C13	4.7		NPO 5%	65D10-101		TCZ-4R7	C10V47C	CNO-547	10TCC-V47	
C14	5.6		10%	65D41-066	NPO-DI 5.6	DD-5R6	L10V56	CNO-568	10TS-V56	
C15	47		5%	65D10-80		TCZ-47	C10Q47C	CNO-447	10TCC-Q47	
C16	47		NPO 5%	65D10-92		TCZ-47	C10Q47C	CNO-447	10TCC-Q47	
C17	4.7		10%	65B26-047	NPO-DI 4.7	TCZ-4R7	C10V47C	CNO-547	10TCC-V47	
C18	47		NPO 5%	65D10-80		TCZ-47	C10Q47C	CNO-447	10TCC-Q47	
C19	4700			65D10-112	BPD-0047	DD-472	BYA10D47M	B-247	10TS-D47	
C20	5000			65D10-5	BPD-005	DD-502	BYA10D5	B-250	10TS-D50	
C21	.1	400		64S8-26	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C22	5.1		10%	65B26-051	DL-5	DD-050	L10V5	ZT-555	10TS-V50	
C23	1000	1000		65D10-147	BPD-001	DD-102	BYA10D1	B-210	10TS-D10	
C24	1000			65D10-53	BPD-001	DD-102	BYA10D1	B-210	10TS-D10	
C25	1000			65D10-53	BPD-001	DD-102	BYA10D1	B-210	10TS-D10	
C26	4.5		5%	65B40-045		TCZ-4R7	C10V47C	CNO-547	10TCC-V47	
C27	82		NPO 5%	65D10-98		TCZ-82	C10Q82C	CNO-482	10TCC-Q82	
C28	1000			65D10-53	BPD-001	DD-102	BYA10D1	B-210	10TS-D10	
C29	18		N330 5%	65D10-140					10TCR-Q18	
C30	.047	200	4% Drift	64C16-55						
C31	4700			65D10-112	BPD-0047	DD-472	BYA10D47M	B-247	10TS-D47	
C32	1000		10%	65D10-184	DL-1000	DD-102	PM5DI	JL-210	10TS-D10	
C33	1000			65D10-1	BPD-01	DD-103	BYA10SI	B-110	10TS-S10	
C34	10000			65D10-3	BPD-01	DD-103	BYA10SI	B-110	10TS-S10	
C35	10000	1400		65D10-65	DAC-27	DD16-103	HVE16SI	2HV-110	20HKB-S1	
C36	.1	400	4% Drift	64C16-30						
C37	3300			65D10-35	BPD-0033	DD-332	BYA10D33	B-233	10TS-D33	
C38	470			65D10-70	BPD-00047	DD-471	BYA10T47	B-347	10TS-T47	
C39	20000			65D10-127	BPD-02	DD-203	BYB26S2	B-220	10TS-S2	
C40	4700			65D30-70	BPD-00047	DD-471	BYA10T47	B-347	10TS-T47	
C41	.022	1000	10%	64A13-3						
C42	1000			65D10-53	BPD-001	DD-102	BYA10D1	B-210	10TS-D10	
C43	.039	600	10%	64C26-25						
C44	.1	1000		64B2-52	P1088N-1		CUB10P1		10TM-P1	
C45	.0068	600		64B8-16	P688N-0068	DD-682	CUB6D68	GEM-6268	6TM-D68	
C46	2200			65D10-111	BPD-0022	DD-222	BYA10D22	B-222	10TS-D22	
C47	.01	600		64B8-13	P688N-01	DD-103	CUB6SI	GEM-611	6TM-SI	
C48	680			65D10-200	BPD-00068	DD-681	BYA10T68	B-368	10TS-T68	
C49	.022	600	10%	64B32-1	V64C8822 10%		PM8S22	GTM-8122	6TM-S22	
C50	.047	600		64B8-9	P688N-047	DD-503	CUB6S47	GEM-6147	6TM-S47	
C51	.047	1000		64B2-30	P1088N-047		CUB10S47	GEM-10147	10TM-S47	①
C52	100		NPO 5%	65D10-105		DTZ-100	CUB1TC	CNC-310	10TCC-T10	
C53	1000		10%	65D10-184	DL-1000	DD-102	PM5DI	JL-210	10TS-D10	
C54	1000			65D10-53	BPD-001	DD-102	BYA10D1	B-210	10TS-D10	
C55	2200			65D10-111	BPD-0022	DD-222	BYA10D22	B-222	10TS-D22	
C56	.047	600		64B8-9	P688N-047	DD-503	CUB6S47	GEM-6147	6TM-S47	
C57	3900		10%	65B21-392	1469-0039		IR5D39	JL-239	MS-239	
C58	820		10%	65B21-821	1469-00082	DD-821	IR5T82	JL-382	MS-382	
C59	680		10%	65B21-681	1469-00068	DD-368	IR5T68	JL-368	MS-368	
C60	4700			65D10-112	BPD-0047	DD-472	BYA10D47M	B-247	10TS-D47	
C61	100		N750	65D10-84	N750-DI 100	DTN-310	C10T10	CNT-310	10TCU-T10	
C62	.047	600		64B8-9	P688N-047	DD-503	CUB6S47	GEM-6147	6TM-S47	
C63	.047	1000		64B2-30	P1088N-047	DD-503	CUB10S47	GEM-10147	10TM-S47	
C64	.047	1000		64B2-30	P1088N-047	DD-503	CUB10S47	GEM-10147	10TM-S47	
C65	.022	1800		64B2-43	VBC-39		CUB1S822	GEM-1813	MS-822	② ③
C66	300	2000	N1500 10%	65D10-202						③
C67	300	2000	N1500 10%	65D10-203						
C68	130	2000	N1500 10%	65D10-148						
C69	10000			65D10-3	BPD-01	DD-103	BYA10SI	B-110	10TS-S10	
C70	.047	600		63B12-1	P688N-047	DD-503	CUB6S47	GEM-6147	6TM-S47	①

CAPACITORS (cont)

ITEM No	RATING CAP	VOLT	TOL	REPLACEMENT DATA ADMIRAL PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C71	1000	1000		65D10-147	BPD-001	DD-102	BYA10D1	B-210	10TS-D10	①
C72	1000	1000		65D10-147	BPD-001	DD-102	BYA10D1	B-210	10TS-D10	
C73	1	600		63B12-7	P688N-1	DF-104	CUB6PI	GEM-601	6TM-P1	③
C74	820			65D10-91	DI-820	DD-821	BYA10T82	B-382	10TS-T82	
C75	820			65D10-91	DI-820	DD-821	BYA10T82	B-382	10TS-T82	
C76	820			65D10-91	DI-820	DD-821	BYA10T82	B-382	10TS-T82	
C77	820			65D10-91	DI-820	DD-821	BYA10T82	B-382	10TS-T82	
C78	1000			65D10-53	BPD-001	DD-102	BYA10D1	B-210	10TS-D10	

① Not used in some versions.
② Some versions may use 330mmf 2000V in this application.
③ Some versions may use .047mfd 600V in this application.

CONTROLS

ITEM No.	RATING RESISTANCE	WATTS	REPLACEMENT DATA ADMIRAL PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1meg	½	75B44-1					Volume
B	Switch							Push-Pull Off-On
R2A	300K	½	75C43-6	F1-34		●GJ-1120		Vert. Hold
B	750Ω	½		R2-4				Vert. Lin.
R3A	25K	½	75C43-5	F1-27		▲GJ-1121	▲(	Contrast
B	2.5meg	½		R3-76				Height
R4A	100K	½	75D20-118	AB-36	B47-100K-S	BI7-128	PTA15L	AGC
B	Shaft			AK-19	Not Req.	TMI	Not Req.	
R5A	100K	½	75D20-115	AB-40	B47-100K-S	QI-128	PTA15L	Brightness
B	Shaft			AK-19	Not Req.	TQ	Not Req.	

● "Concentrikit" Equivalent: K-8 Kit with Base Elements & Shafts: BI-131, P17-028 (Panel) BI-105, RI5-005 (Rear) R-5 Retainer
▲ "Concentrikit" Equivalent: K-8 Kit with Base Elements & Shafts: BI-120, P17-028 (Panel) BI-239, RI5-005 (Rear) R-5 Retainer
▲ "STA-LOC" Equivalent: FA253L, RU255L, C5875A, I5437.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise stated.

ITEM No.	RATING OHMS	WATT	ADMIRAL PART No.	NOTES
R6	22K	3	61B24-357	
R7	4700Ω	4	61B24-441	Note 1
R8	1200Ω		60B8-123	
R9	15meg		60B8-156	
R10	5 6meg 5%		60B7-565	
R11	1 6meg 5%		60B7-186	
R12	150K		60B8-154	
R13	1000Ω		60B8-102	
R14	18K 5%		60B7-183	
R15	12K 5%		60B7-123	
R16	43Ω 5%		60B7-430	
R17	470Ω		60B8-471	
R18	150Ω		60B8-151	
R19	3900Ω		60B8-392	
R20	4700Ω		60B-472	
R21	100Ω		60B8-101	
R22	5600Ω	7	61B24-763	
R23	33K		60B8-333	
R24	56K		60B8-563	
R25	33K		60B8-333	
R26	8200Ω		60B8-822	
R27	56K		60B8-563	
R28	8200Ω		60B8-822	
R29	180K		60B8-184	
R30	120K		60B8-124	Note 2
R31	1meg		60B8-105	
R32	47K		60B8-473	
R33	33K		60B8-333	
R34	6800Ω	1	60B14-682	
R35	12meg		60B8-126	
R36	100K		60B8-104	
R37	100K		60B8-104	
R38	100K		60B8-104	
R39	470K		60B8-474	
R40	100K		60B8-104	
R41	560K		60B8-564	
R42	8200Ω		60B8-822	
R43	560Ω		60B8-561	
R44	910K 5%		60B7-914	
R45	1.1meg 5%		60B7-115	
R46	150Ω		60B8-151	
R47	330Ω	2	60B30-331	
R48	8200Ω	3	61B24-347	
R49	100K		60B8-104	
R50	47K		60B8-473	

ITEM No.	RATING OHMS	WATT	ADMIRAL PART No.	NOTES
R51	10K	3	61B24-349	
R52	220K		60B8-224	
R53	68K		60B8-683	
R54	33K		60B8-333	
R55	68K		60B8-683	
R56	1.2meg		60B8-125	
R57	100K		60B8-104	
R58	22K		60B8-223	
R59	82K		60B14-823	
R60	1.2meg		60B8-125	
R61	2.7meg		60B8-275	
R62	2.2meg		60B8-225	
R63	390Ω	1	60B14-391	
R64	39K		60B8-393	
R65	100K	1	60B14-104	
R66	120K	1	60B14-124	
R67	270K		60B8-274	
R68	680K		60B8-684	
R69	1meg		60B8-105	
R70	100K		60B8-104	
R71	10K		60B8-103	
R72	56K		60B8-563	Note 3
R73	1100Ω 5%		60B28-87	
R74	47K		60B8-473	
R75	82K		60B8-823	
R76	18K 5%		60B7-183	
R77	1meg		60B8-105	
R78	100Ω		60B8-101	
R79	15K	3	61B24-353	
R80	330K		60B8-334	
R81	120K		60B8-124	
R82	47K		60B8-473	
R83	470K		60B8-474	
R84	4700Ω		60B8-472	
R85	220Ω		60B8-221	
R86	3.8Ω Cold		61A27	
R87	220Ω		60B8-221	
R88	150K		60B8-154	Note 3
R89	1Ω		60B28-63	
R90	33K	1	60B14-333	
R91	270Ω	2	60B20-271	
R92	8Ω	12	61B1-49	Note 4
R93	5Ω	20	61B3-34	Note 5
R94	20K	7	61B24-758	Note 6

Note 1. Ch. 15A2, 15UA2 use 5600Ω 4W in this application (Part #61B24-443).
Note 2. Not used in Ch. 15A2, 15UA2.
Note 3. Not used in some versions
Note 4. Some versions may use 8Ω 10W in this application (Part #61A17-27).
Note 5. Ch. 15UA2 uses 47Ω 20W in this application (Part #61B3-25).
Note 6. Not used in Ch. 15A2, 15B2, 15B3D, 15UA2

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	ADMIRAL PART No.	REPLACEMENT DATA	
K1	Chassis Isolation	4700mmf ⓖ 1500V, .75-1.5meg	63B10-3	Centralab Sprague	RC-490 AC1-2

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA ADMIRAL PART No.	Gramer PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	1st Video IF	72C123-41						
L2	2nd Video IF	72C132-42						
L3	3rd Video IF	72B207-1						
L4	RF Choke	73B31-4						
L5	Shunt Peaking Coil	73B5-30	19-3500	19-3500	TV-203	6174	VP-8	500uh
L6	Resonant Choke	73B31-3						38uh
L7A	Sound Take-Off	72C165-2						
B	4.5 MC Trap							
L8	Series Peaking Coil	73B5-39						†
L9	Shunt Peaking Coil	73B5-34			TV-207	6156		879uh
L10A	2nd Sound IF	72B208-1						Tap @ 7Ω
B	Phase Shift							
L11	Quadrature Coil	72B133-3T						
L12	Fil. Choke	73B37-3	19-1001	19-1001	BC-562	4604		1 4uh
L13	Fil. Choke	73B37-3	19-1001	19-1001	BC-562	4604		1 4uh
L14	Fil. Choke	73B37-3	19-1001	19-1001	BC-562	4604		1 4uh
L15	Line Choke	73B31-1						68uh

† Wound on 13K resistor

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES. PRI	SEC.	REPLACEMENT DATA ADMIRAL PART No.	Halldorson PART No.	Merit PART No.	Miller PART No.	Ram PART No.	Thordorson PART No.	NOTES
L16	92Ω		94D17-7	HS-7 ▲	TV-165 ▲	6211 *	H-102 +	HS-7 ▲	Horiz Stabilizer

▲ Disregard tap. * Disregard tap and enlarge mounting hole. + Enlarge mounting hole.

FILTER CHOKE

ITEM No.	RATINGS CURRENT (Measured)	DC RES	INDUCTANCE @ CURRENT 1000 (~)	REPLACEMENT DATA ADMIRAL PART No	Halldorson PART No	Merit PART No	Ram PART No	Stancor PART No	Thordorson PART No.	Triad PART No
L17	280A	27Ω	8 Hy	74B18-24	26C44	C-2974		C-2338	26C44	C-33X

TRANSFORMER (POWER)

ITEM No.	RATING Pri.	REPLACEMENT DATA ADMIRAL PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No	Thordorson PART No.	Triad PART No
T1	117V ⓖ .64V tap ⓖ 24V ⓖ 2.5A tap ⓖ 6.3V ⓖ 1.5A	80C88-1 ①						

① Not used in Ch. 15A2, 15UA2.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA ADMIRAL PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Rogers PART No	Stancor PART No	Thordorson PART No	Triad PART No
T2	Vert. Output	79C43-19							A-113X Ⅰ
T3	Alt. Vert. Output	79B43-19							
	Yoke-Horiz. (18MH)	94D150-6	Y-52 ② ③		Y-110 ② ③ ④		DY-27A ② ③ ④	Y-52 ② ③	Y-60 & NW-23 & YC-110 ③
	(110°)-Vert. (14MH)								YC-1 & CL-1
	Rear Cover & Centering Device	94C152-1							
	Alt. Rear Cover & Centering Device	94D152-1							
T4	Horiz. Output	79D83-1	FLY-137 ⑤ *	X162 ⑤ *	EFR172 ⑤ *	HO-304 ⑤ *	FLY-137 ⑤ *		D-171 *

① Connect as autoformer.
② Requires new rear cover and centering device.
③ Connect same as original.
④ Use original yoke damping network, if necessary.
⑤ Reverse mounting brackets and mount on side Drill new mounting hole(s).

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

	ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	Ram Replacement Connections	Rogers Replacement Connections	Stancor Replacement Connections	Thordorson Replacement Connections	Triad Replacement Connections
	5	5		5	5	5	5	5
	6	6		6	4	6	6	6
	7	7		7	2	7	7	7
	8	8		8	1	8	8	8
	2	2		2	7	2	2	2
	1	1		1	8	1	1	1
Special Notes →		⑥			⑦		⑥	

⑥ If AGC does not function properly, reverse connections to terminals #1 and #2.
⑦ Remove one turn from filament winding.

ADMIRAL MODELS PA17F1, 2, 3, P17T1, 2, 3, P17TF12, 13, 22, 22D, 23, 23D, (Ch. 15A2, 15B2, 15B3D, 15UA2, 40G3, D, 4H3.)

FOLDER 1

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	ADMIRAL PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T5	2700Ω	3-4Ω	79D33-15 ①	24S53	A-3025	AU-605	A-3332	24S53	S-12X	① Alternate Part #79B33-15

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	ADMIRAL PART No.	QUAM PART No.	
SP1	4"	PM	3-4Ω	78B122-4	4A07	

RECTIFIERS

ITEM No.	RATING	REPLACEMENT DATA					NOTES
	CURRENT (Measured)	ADMIRAL PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	SYLVANIA PART No.	
M1	.280A	93B12 ①	HA504 ①	SD-94 ①	40K ①	SR500 ①	① Silicon Type.
M2	.280A	93B12 ①	HA504 ①	SD-94 ①	40K ①	SR500 ①	② Selenium Type.
M3		93B5-6 ②	K1616 ②③				③ Two Required.

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		ADMIRAL PART No.	CBS PART No.	SYLVANIA PART No.	
M4	1N87A	1N87A *	1N60	1N60	Video Detector (Pigtail) * Some versions may use 1N87 in this application.

MISCELLANEOUS

ITEM No.	PART NAME	ADMIRAL PART No.	NOTES
M5	Tuner	94E164-3	VHF, Ch. 15B2, 15B3, 15B3D
	Tuner	94E163-1	VHF, Ch. 15A2
	Tuner	94E163-2	VHF with UHF provisions Ch. 15UA2
	Tuner	94D162-3	UHF Ch. 15UA2
M6	Switch	77B93-1	Push Bar Tuning, Not used in Ch. 15A2, 15UA2
M7	Relay	83C26-1	Off-On-Power, Not used in Ch. 15A2, 15UA2
M8	Circuit Breaker	84B17-4	
M9	Motor & Gear Assy.	91C35-4	Tuning, Ch. 15B3, 15B3D
	Motor & Gear Assy.	91C35-2	Tuning, Ch. 15B2

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Safety Glass	21D120-1	
Knob	33D307-1	Channel Selector, Models P17F1, P17F2, P17F3
Knob	33B310-1	Channel Selector, Push Bar, Models P17F12, P17F13, P17F22, P17F23
Knob	33D306-2	Fine Tuning
Knob	20C24-7	Off-On-Volume
Knob	20D24-8	Contrast, Vert. Hold
Indicator Disc	33D306-1	Models PS17F12, PS17F13, PS17F22, PS17F23
Cabinet	34E139-1	Less Back, Model P17F1
Cabinet	34E139-2	Less Back, Model P17F2
Cabinet	34E139-3	Less Back, Model P17F3
Cabinet	34E139-4	Less Back, Model PS17F12
Cabinet	34E139-5	Less Back, Model PS17F13
Cabinet	34E139-6	Less Back, Model PS17F22
Cabinet	34E139-7	Less Back, Model PS17F23
Antenna	69C234-1	All Models except P17F1
Handle	37C195-1	Models PS17F22, PS17F23
Escutcheon	20D23-2	Models P17F1, P17F2, P17F3
Escutcheon	20D23-1	Models PS17F12, PS17F13, PS17F22, PS17F23

WIRING DATA

High Voltage Lead	Use BELDEN No. 8869
Shielded Hook-up Wire	Use BELDEN No. 8885 (Single Conductor) 8738 (Two Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord (Interlock Type)	Use BELDEN No. 8874
300Ω Tuner Input Lead	Use BELDEN No. 8225
300Ω Antenna Lead-in	Use BELDEN No. 8230 or 8275
Antenna Rotor Cable	Use BELDEN No. 8464 (Flat) or 8484 (Round) - 4 Conductor 8485 (Round) - 5 Conductor 8488 (Round) - 8 Conductor

REMOTE CONTROL PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V13	1st - 2nd AF Amp.	12AX7	
V14	3rd AF Amp. -AGC Rect.	6AV6	
V15	4th AF Amp. -Channel Relay Control	6U8A	

ITEM No.	USE	TYPE	NOTES
V16	Discriminator-Off-On-Volume Relay Control	6BJ8	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	ADMIRAL PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	
C79	50	25	67B4-45	PRS1350	BBR50-25	TC29	TD-50-25	TE-1209	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	ADMIRAL PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C80	120		N1500 10%	65D10-136						
C81	20000			65D10-137	BPD-02	DD-203	BYB6S2	B-120	10TS-S20	
C82	120		10%	65D10-136	DI-120	DD-121	L10T12	CNO-312	10TS-T12	
C83	.047	200	4% Drift	65B2-50						
C84	20000			65D10-137	BPD-02	DD-203	BYB6S2	B-120	10TS-S 20	
C85	47		N750 5%	65D10-177		DTN-47	C10Q47U	CN7-447	10TCU-Q47	
C86	10000			65D10-3	BPD-01	DD-103	BYA10S1	B-110	10TS-S1 0	
C87	150		10%	65D10-33	DI-150	DD-151	L10T15	CNO-315	10TS-T15	
C88	10000			65D10-3	BPD-01	DD-103	BYA10S1	B-110	10TS-S10	
C89	30		N2200 10%	65D10-189						
C90	10000			65D10-3	BPD-01	DD-103	BYA10S1	B-110	10TS-S10	
C91	400		5%	65A48-401				MCE243	MS-34	
C92	100		5%	65A48-101	1469-0001	TCZ-100	22R5T1	MCE235	MS-31	
C93	330		5%	65A48-331		TCZ-333	22R5T33		10TCC-T33	
C94	30		N2200 10%	65D10-189						
C95	1000			65D10-82	BPD-001	DD-102	BYA10D1	B-210	10TS-D10	
C96	.047	200	4% Drift	65B2-50						
C97	1000			65D10-82	BPD-001	DD-102	BYA10D1	B-210	10TS-D10	
C98	.047	200	4% Drift	64B2-50						
C99	10000			65D10-3	BPD-01	DD-103	BYA10S1	B-110	10TS-S1 0	
C100	4700			65D10-71	BPD-0047	DD-472	BYA10D47M	B-247	10TS-D47	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		ADMIRAL PART No.	NOTES
	OHMS	WATT		
R95	100K		60B8-104	
R96	150K		60B8-154	
R97	22K		60B8-223	
R98	470Ω		60B8-471	
R99	470K		60B8-474	
R100	3.3meg		60B8-335	
R101	150K		60B8-154	
R102	2200Ω		60B8-222	
R103	1meg		60B8-105	
R104	5.6meg		60B8-565	
R105	150K		60B8-154	
R106	22K		60B8-223	
R107	3.3meg		60B8-335	
R108	1meg		60B8-105	
R109	3.3meg		60B8-335	
R110	22K	1	60B14-223	

ITEM No.	RATING		ADMIRAL PART No.	NOTES
	OHMS	WATT		
R111	100K		60B8-104	
R112	62K 5%	1	60B13-623	
R113	2.2meg		60B8-225	
R114	2.2meg		60B8-225	
R115	2.2meg		60B8-225	
R116	2.2meg		60B8-225	
R117	1meg		60B8-105	
R118	22meg		60B8-226	
R119	470K		60B8-474	
R120	1meg		60B8-105	
R121	470K		60B8-474	
R122	82K		60B8-823	
R123	22K		60B8-223	
R124	33K		60B8-333	
R125	4700Ω		60B8-472	
R126	22meg		60B8-226	

COILS (RF-IF)

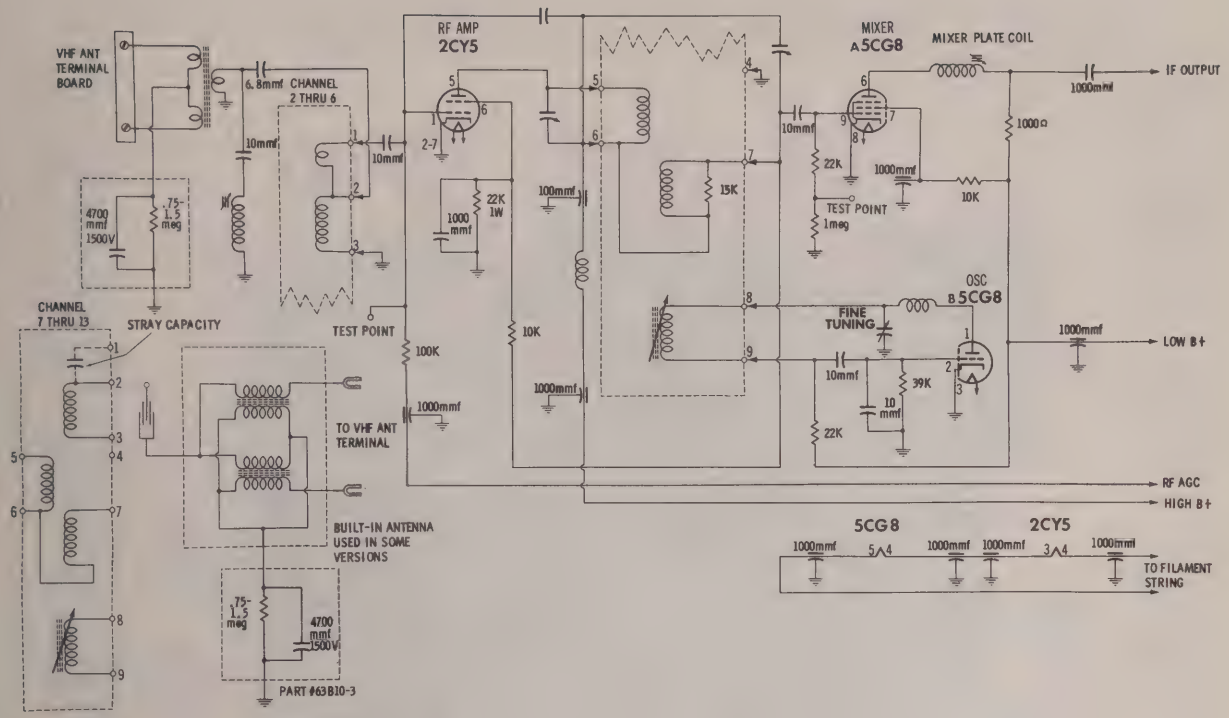
ITEM No.	USE	REPLACEMENT DATA						NOTES
		ADMIRAL PART No.	Gramer PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L18	1st Amp. Input Coil	69C230-2						
L19	Discriminator	69C231-5						

RECTIFIERS

ITEM No.	RATING	REPLACEMENT DATA					NOTES
	CURRENT (Measured)	ADMIRAL PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	SYLVANIA PART No.	
M10	.001A	93A15-1 ①	1159 ①	D-5410 ①	10 ①		① Selenium Type.

MISCELLANEOUS

ITEM No.	PART NAME	ADMIRAL PART No.	NOTES
M11	Switch	77B59-4	"Son-R" Off-On



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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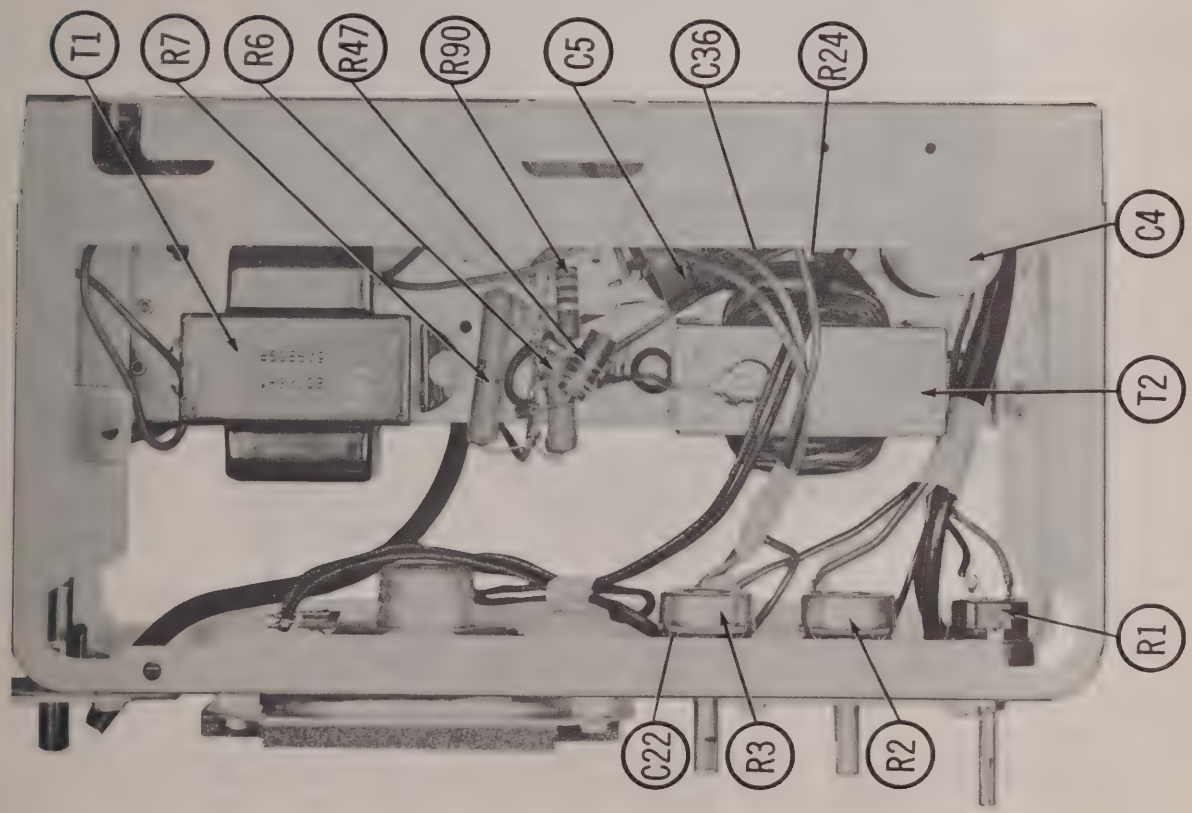
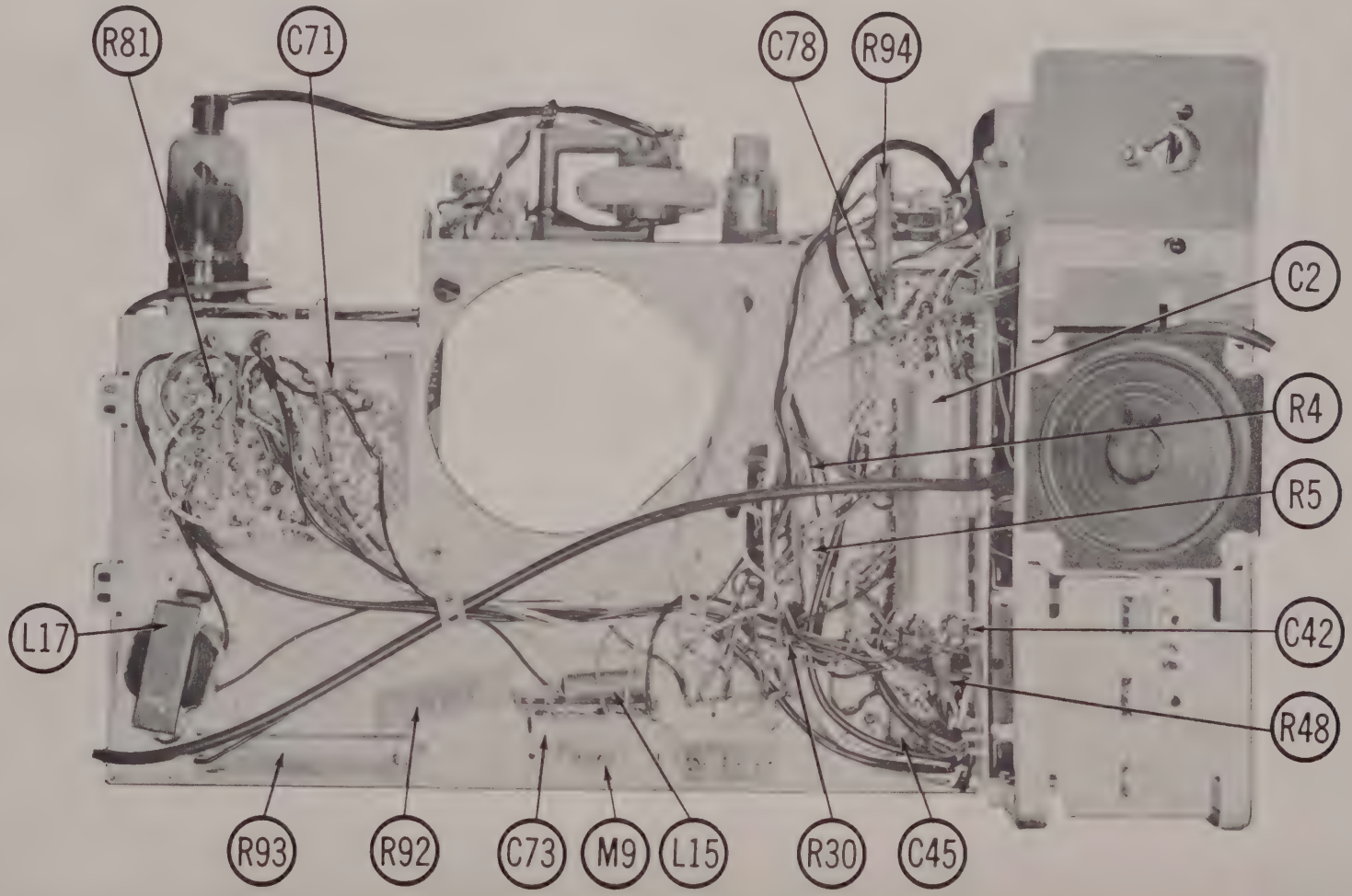
VHF TUNER 94E163-1

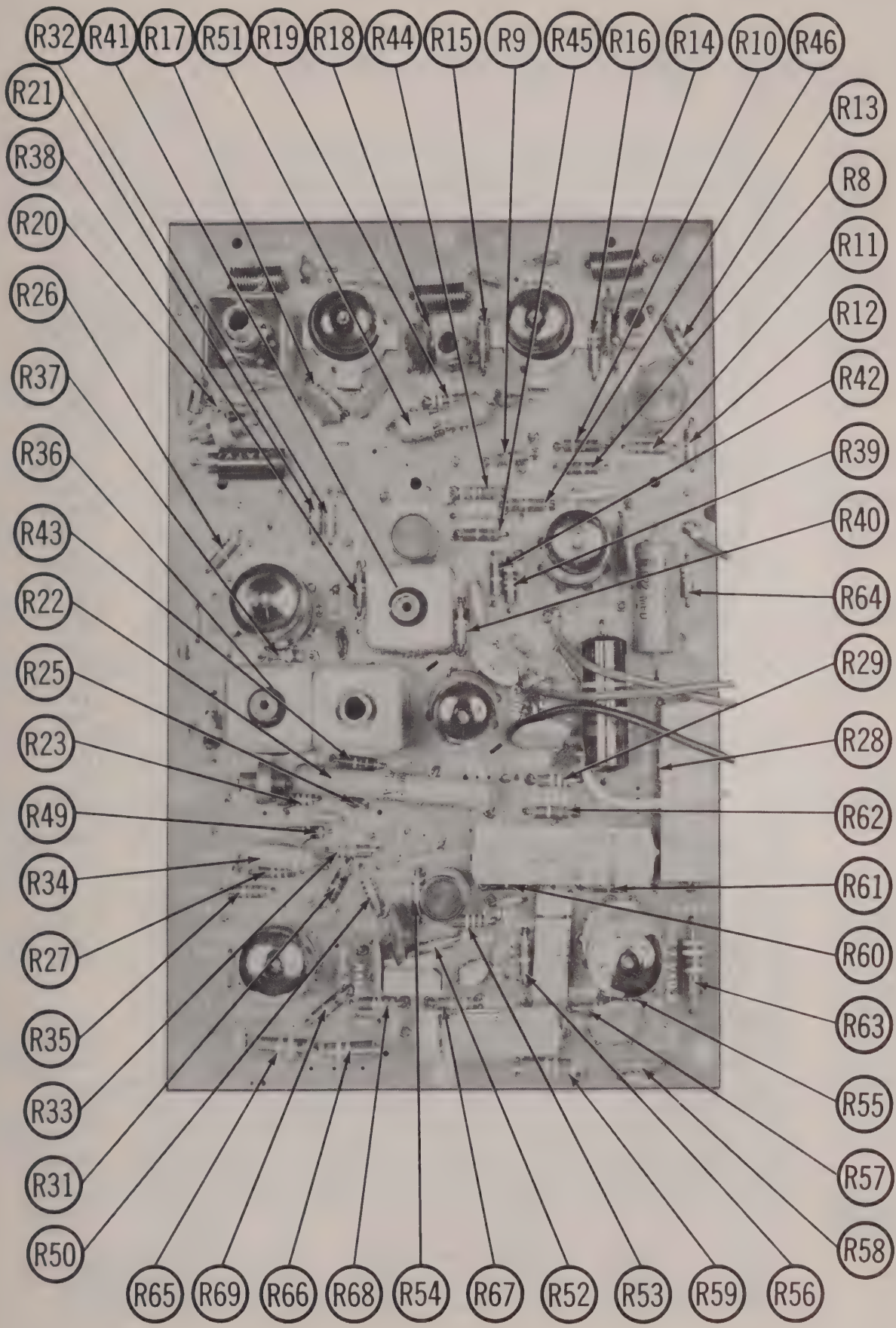


CHASSIS SIDE VIEW

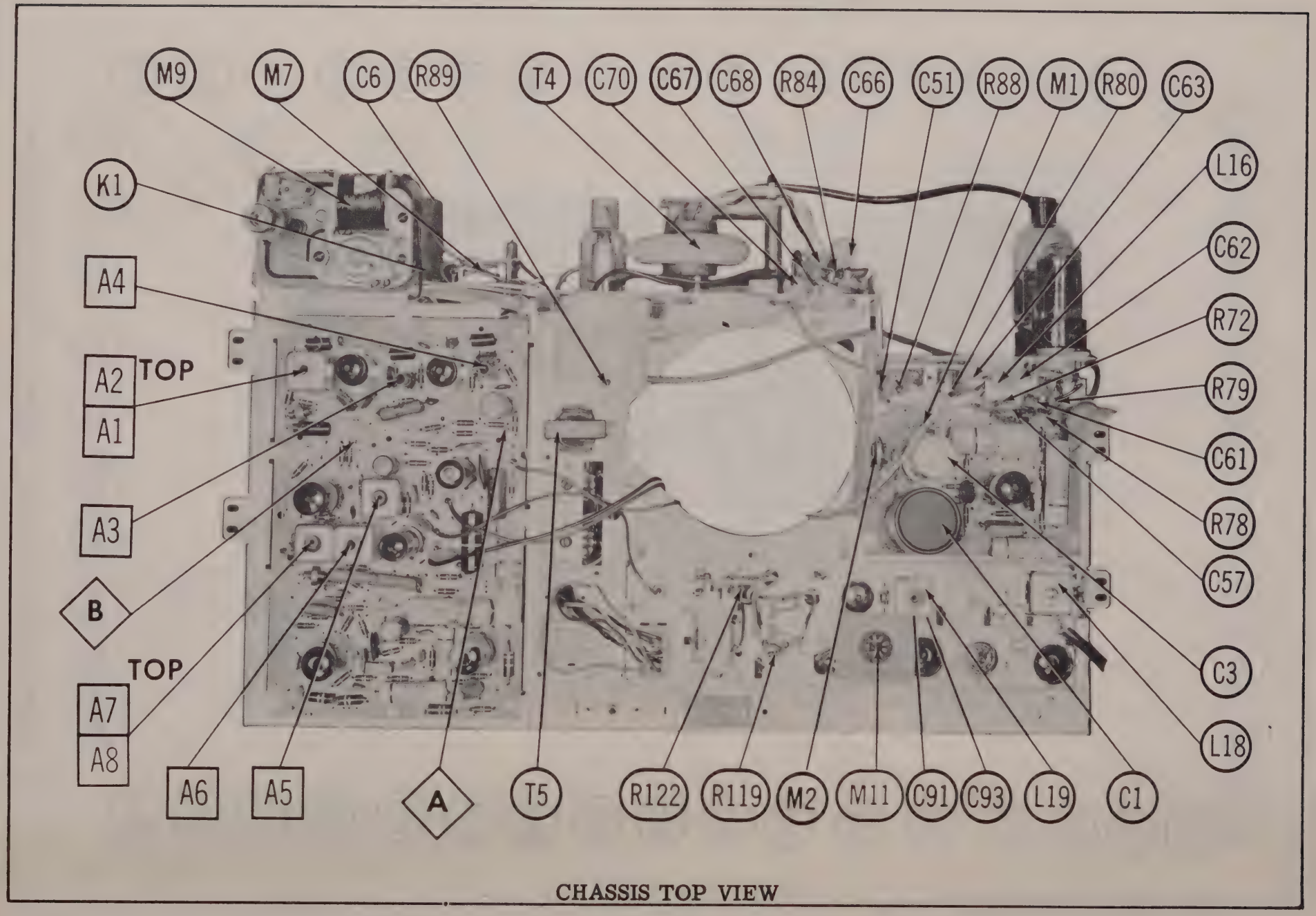
FOLDER 1



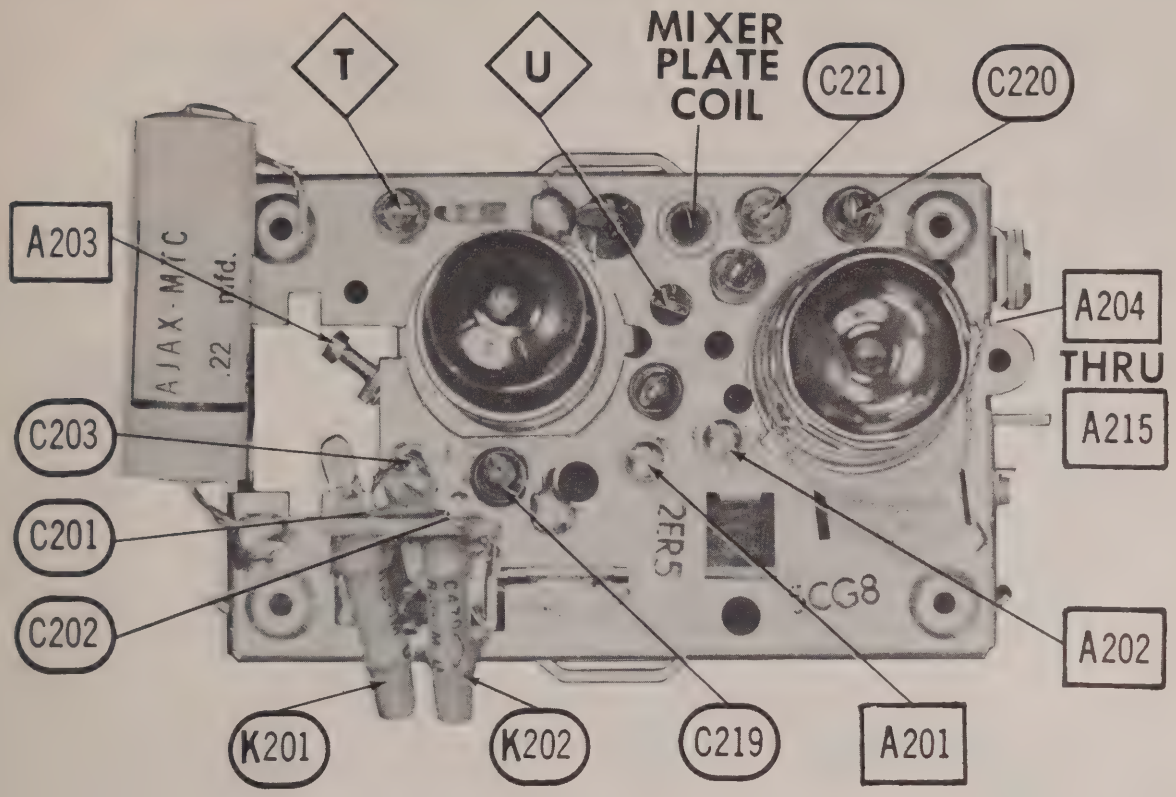
CHASSIS FRONT VIEW



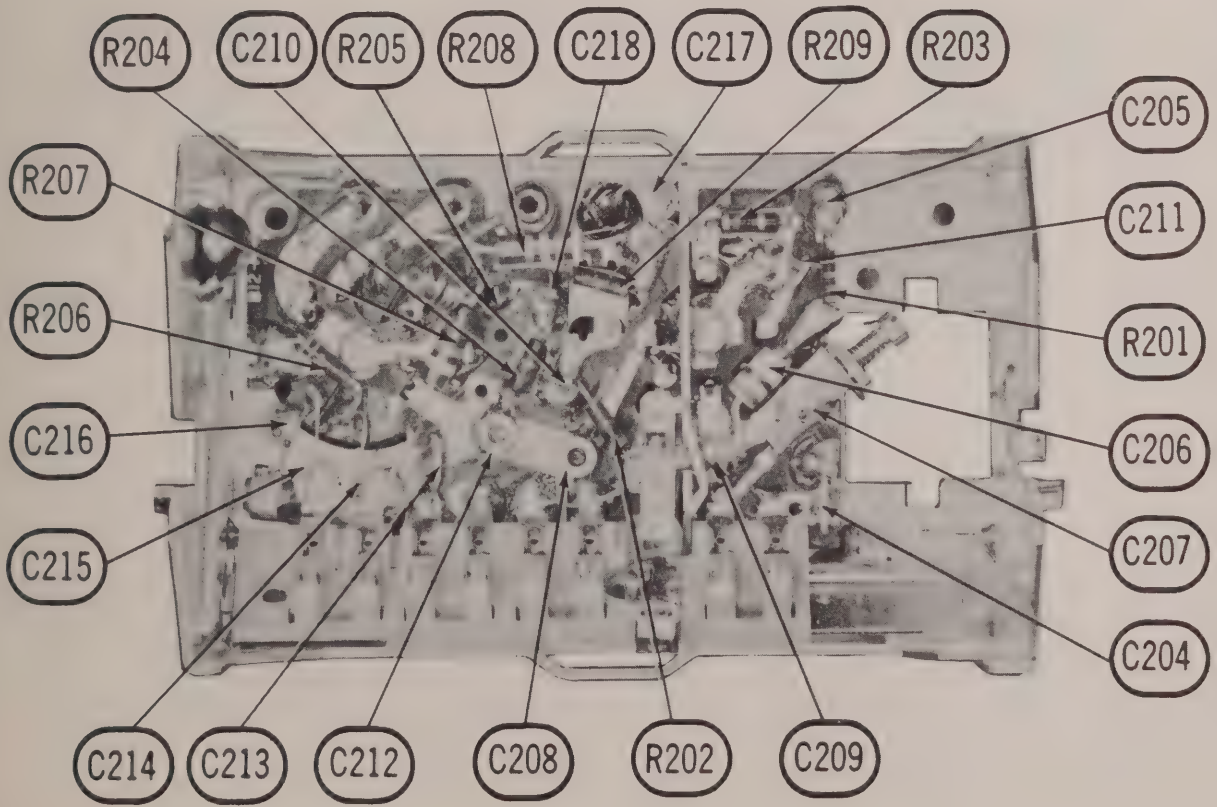
MAIN PRINTED BOARD - RESISTOR IDENTIFICATION



CHASSIS TOP VIEW



TUNER 94E164-3 - TOP VIEW



TUNER 94E164-3 - BOTTOM VIEW

TUNER PARTS LIST AND DESCRIPTIONS

94E164-3

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V201	RF Amp.	2ER5/GG	

ITEM No.	USE	TYPE	NOTES
V202	Mixer-Osc.	5CG8	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	ADMIRAL PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C201	120		N2200 10%							
C202	15		10%		DI-15	D6-150	L10Q15	CNO-415	5TCC-Q15S 10% *	
C203	30									
C204	28									
C205	800				EF-001	MFT-1000			503C-D1	
C206	1				NPO-SI 1	TCZ-1		CNO-510	5TCCB-V1	①
C207	1-7					829-7				
C208	1-4.5					829-6		CT-551		
C209	85									
C210	800				EF-001	MFT-1000			503C-D1	
C211	28									
C212	1-4.5					829-6		CT-551		
C213	33				BPD-000033	DD-330	L10Q33	CNO-433	5GA-Q33	
C214	18				DI-18	DD-180	L10Q18	CNO-418	5GA-Q18	
C215	7.5					DD-7R5			5GA-V75	
C216	1000				BPD-001	DD-102	BYA10D1	B-210	5HK-D1	
C217	1000				BPD-001	DD-102	BYA10D1	B-210	5HK-D1	
C218	800				EF-001	MFT-1000			503C-D1	
C219	1000				EF-001	MFT-1000			503C-D1	
C220	1000				EF-001	MFT-1000			503C-D1	
C221	1000				EF-001	MFT-1000			503C-D1	

* Not normally in distributor's stock. Available thru distributor on order to manufacturer. ① Not used in some versions.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		ADMIRAL PART No.	NOTES
	OHMS	WATT		
R201	47K			
R202	1000Ω			
R203	47Ω			
R204	2700Ω			
R205	220K			

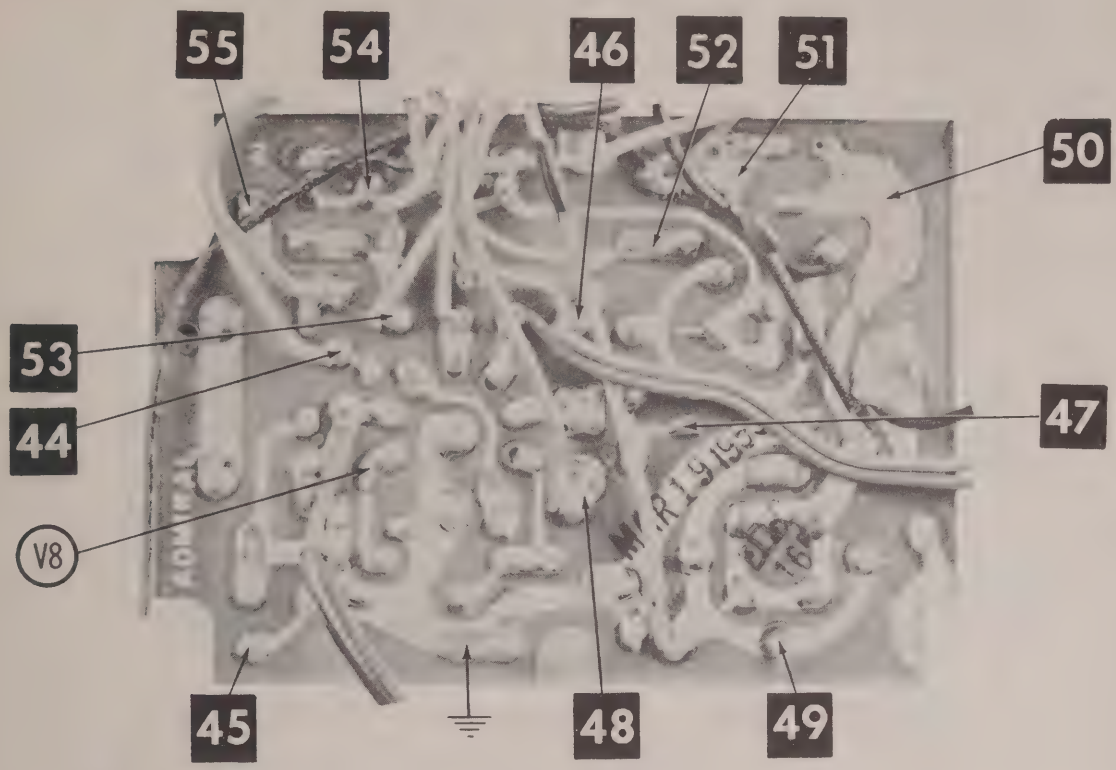
Note 1. Some versions may use a 3900Ω in this application.

ITEM No.	RATING		ADMIRAL PART No.	NOTES
	OHMS	WATT		
R206	4700Ω			Note 1
R207	4700Ω			
R208	91K 5%			
R209	1000Ω			

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	ADMIRAL PART No.	REPLACEMENT DATA	
K201	Antenna Isolation	470mmf, .3-1meg		Centralab Sprague	RC-471 AC1-1
K202	Antenna Isolation	470mmf, .3-1meg		Centralab Sprague	RC-471 AC1-1

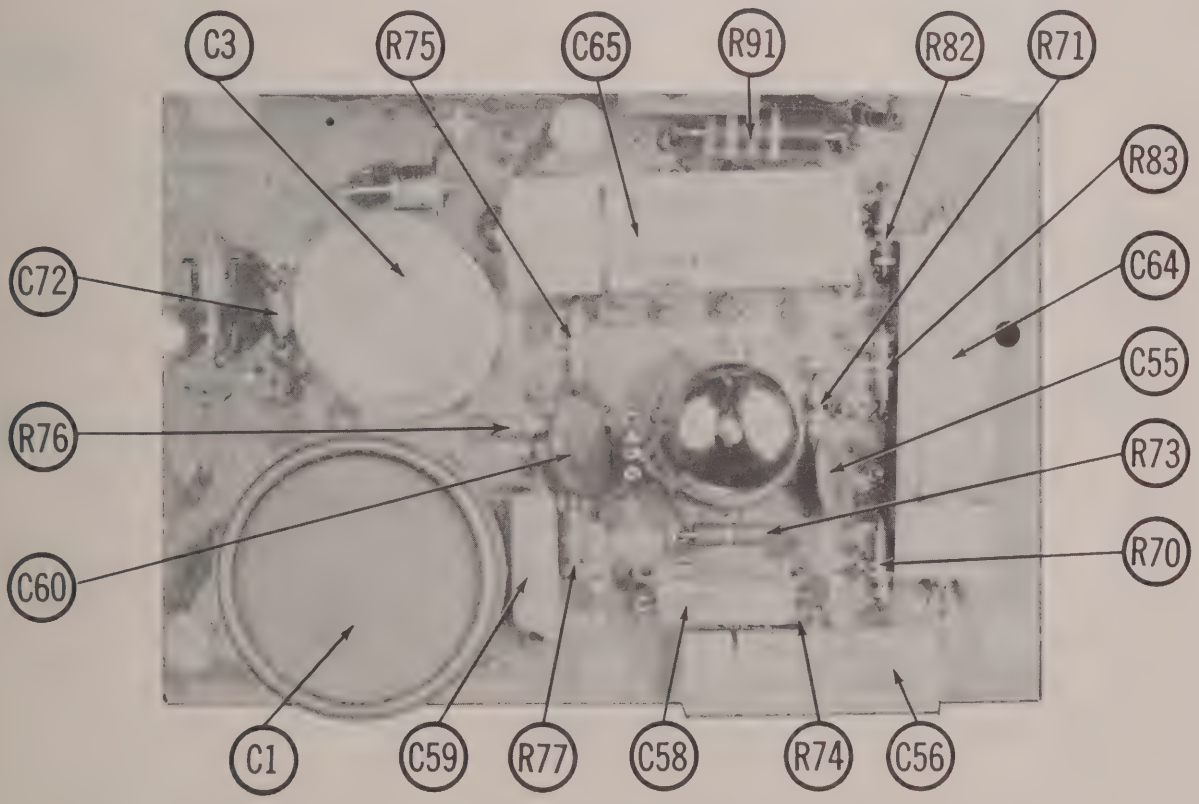
CircuiTrace Numbers 44 thru 55



A Howard W. Sams CIRCUITRACE* Photo

SWEEP
PRINTED BOARD

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



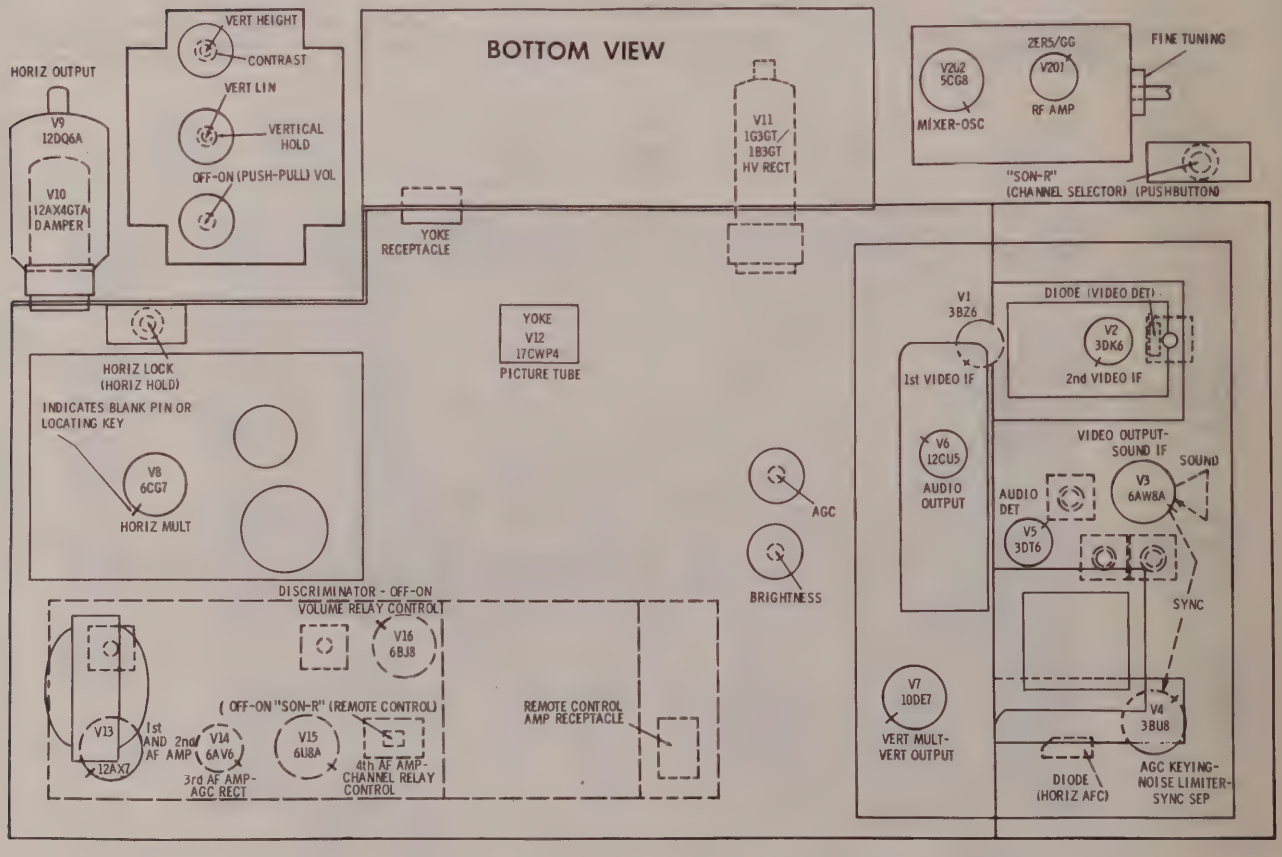
SWEEP
PRINTED BOARD

RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	3BZ6	150K	43Ω	4Ω	5Ω	▪ 3900Ω	▪3900Ω	0Ω		
V2	3DK6	.1Ω	150Ω	5Ω	5.5Ω	▪470Ω	▪ 470Ω	0Ω		
V3	6AW8A	0Ω	100K	▪50K	7Ω	5.5Ω	0Ω	4800Ω	▪ 7000Ω	†5000Ω
V4	3BU8	▪ 0Ω	†7100Ω	1.8meg	10.5Ω	10Ω	†22K	†1meg	†47K	†12meg
V5	3DT6	14Ω	560Ω	10Ω	9.5Ω	†800K	▪8200Ω	560K		
V6	12CU5	INF	500K	7Ω	8.5Ω	500K	†330Ω	†560Ω		
V7	10DE7	†310Ω	1.5meg	1.5meg	2Ω	0Ω	• †2.5meg	1meg	•230K	•600Ω
V8	6CG7	†10K	2.3meg	1100Ω	11.5Ω	10.5Ω	†82K	47K	1100Ω	0Ω
V9	12DQ6A	TP	13Ω	NC	†15K	1meg	NC	11.5Ω	0Ω	TOP CAP †6Ω
V10	12AX4GTA	NC	NC	¶1.8meg	NC	†0Ω	NC	13Ω	14Ω	
V11	1G3GT/ 1B3GT	PINS 1 THRU 8 HAVE INFINITE RESISTANCE								TOP CAP †450Ω
V12	17CWP4	9.5Ω	39K	†170K	0Ω	NC	39K	• 220K	8.5Ω	
V201	2ER5/GG	47Ω	5meg	2Ω	2.5Ω	†6000Ω	0Ω	47Ω		
V202	5CG8	3900Ω	▪ 5900Ω	0Ω	2.5Ω	4Ω	▪ 2200Ω	▪ 1200Ω	0Ω	220K
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
• THIS READING WILL VARY. CONTROL SET FOR NORMAL OPERATION.
† MEASURED FROM 265V SOURCE.
† MEASURED FROM PIN 3 OF V10.
▪ MEASURED FROM 140V SOURCE.

NC NO CONNECTION
TP TIE POINT



TUBE PLACEMENT CHART

PHOTOFACT* Folder with CIRCUITRACE*

EMERSON MODELS 1500, 1502, 1503, 1504, 1505, 1506 (Ch. 120451H, HC, 120452M, MC)

IMPORTANT FILING NOTICE

The TV Folder for this envelope will be found among the first folders in this complete Set of folders.

Merely insert the corresponding folder on this model in this envelope to retain proper filing and indexing order.

EMERSON MODELS 1500, 1502, 1503, 1504, 1505, 1506 (Ch. 120451H, HC, 120452M, MC)

MODEL 1506 (Ch. 120451H)

EMERSON MODELS 1500, 1502, 1503, 1504, 1505, 1506 (Ch. 120451H, HC, 120452M, MC)

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The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1959 Howard W. Sams & Co., Inc., Indianapolis 6, Indiana. Printed in U.S. of America

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EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

EMERSON MODELS 1500, 1502, 1503, 1504, 1505, 1506 (Ch. 120451H, HC, 120452M, MC)

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL MODEL 1506

1. Remove 3 metal screws holding rear cover. Remove antenna leads. Remove rear cover.
2. Remove 7 push-on type knobs from the side.
3. Remove speaker leads, HV lead, picture tube socket, ion trap, and yoke clamp.
4. Remove 1 screw at top left rear of cabinet holding VHF tuner brace.
5. Remove 1 screw on side of cabinet, near control knobs, holding control bracket.
6. Remove 4 chassis bolts from bottom of cabinet.
7. Remove chassis.

PICTURE TUBE REMOVAL

1. Remove 2 metal screws from bottom of front. Pull front out at the bottom and lift to remove.
2. Remove 3 metal screws holding rear cover. Remove antenna leads. Remove rear cover.
3. Remove HV lead, picture tube socket, ion trap, and yoke clamp.
4. Remove 2 picture tube mounting clamp bolts.
5. Remove picture tube from the front of the cabinet.

MODEL 1506 (Ch. 120451H)

CAUTION

ONE SIDE OF AC LINE CONNECTED TO CHASSIS.

TRADE NAME	Emerson	MODELS	CHASSIS
		1500, 1502, 1506	120451H
		1500, 1504	120451HC
		1503, 1505	120452M
		1505	120452MC
MANUFACTURER	Emerson Radio & Phonograph Corp., 524 W. 23rd St., New 11, N.Y.		
TYPE SET	Television Receiver		
TUBES	VHF-Fifteen, UHF-Sixteen		
POWER SUPPLY	110-120 Volts AC, 60 Cycle	RATING 115 Watts, 1.22 Amp. @ 117 Volts AC	
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)		

SERVICING IN THE FIELD

SAFETY GLASS REMOVAL

Remove 2 metal screws from bottom of front. Pull bottom of front out and up to remove. CAUTION: Use only mild soap and water for cleaning.

FUSE

One fuse is used for low voltage power supply protection. (For location, see "Tube Placement Chart".)

TUNER OSCILLATOR ADJUSTMENTS

To touch-up the VHF Oscillator, remove Channel Selector and Fine Tuning knobs.

AGC

No provision is made to vary the AGC on this receiver.

FOCUS

No provision is made to vary the focus on this receiver.

SYNC STABILITY

Sync stability may be varied by means of a Picture Stabilizer control. (For location, see "Tube Placement Chart".)

HORIZONTAL OSCILLATOR FIELD ADJUSTMENTS

Coarse adjustment of the Horizontal Hold is accomplished by the proper setting of the Horizontal Frequency slug. (For location, see "Tube Placement Chart".)

BUZZ ADJUSTMENT

To eliminate intercarrier buzz, adjust the Discriminator secondary (A7) located on top of chassis.

CENTERING

Centering is accomplished by 2 magnetic rings, located behind the yoke, on the neck of the picture tube.

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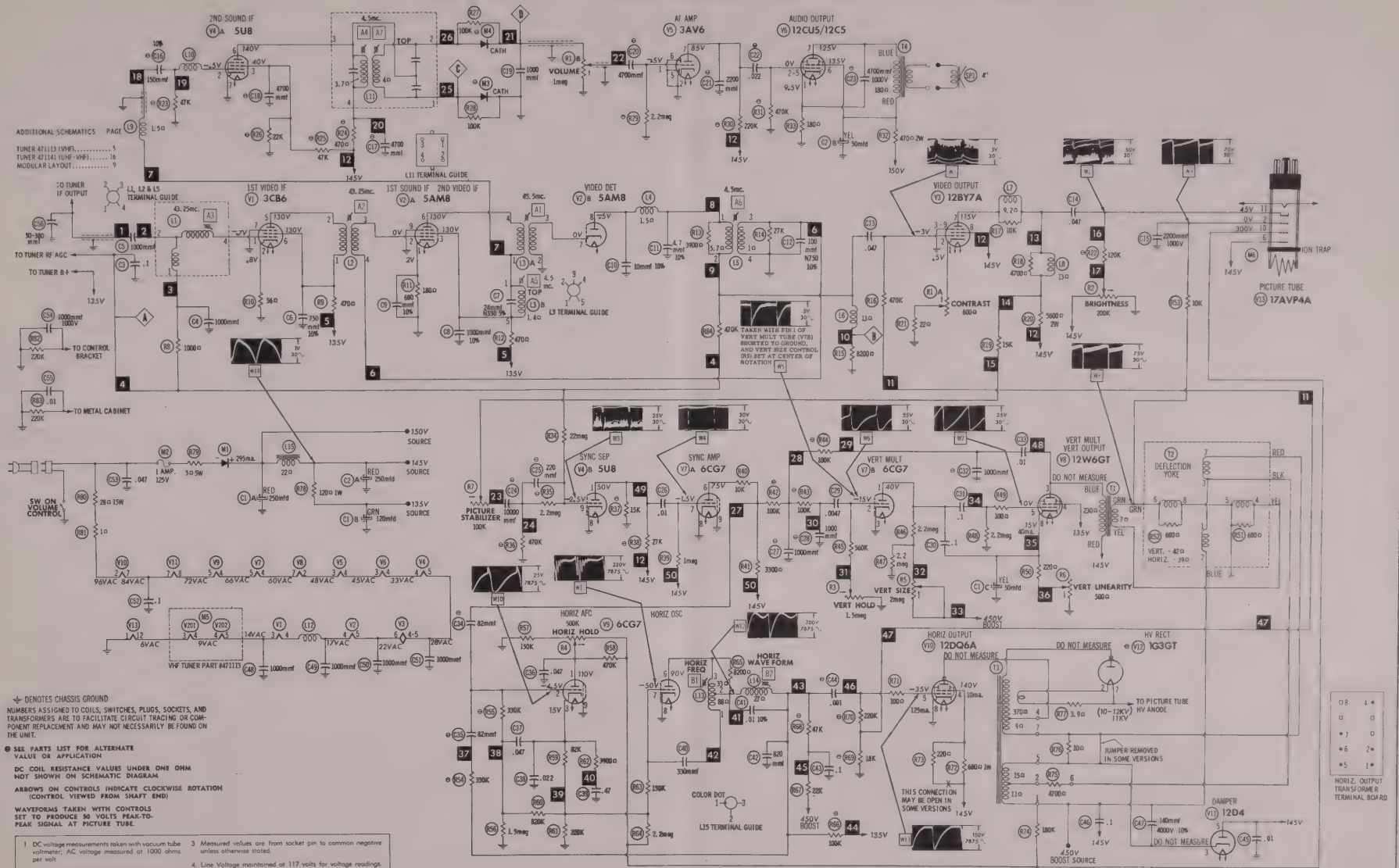
JA444

EMERSON MODELS 1500, 1502, 1503, 1504, 1505, 1506 (Ch. 120451H, HC, 120452M, MC)

EMERSON MODELS 1500, 1502, 1503, 1504, 1505, 1506 (Ch. 120451H, HC, 120452M, MC)

SET 456 FOLDER 2



ADDITIONAL SCHEMATICS PAGE

TUNER 471113 (VHF)..... 5
TUNER 471141 (UHF-VHF)..... 16
MODULAR LAYOUT..... 9

⏚ DENOTES CHASSIS GROUND

NUMBERS ASSIGNED TO COILS, SWITCHES, PLUGS, SOCKETS, AND TRANSFORMERS ARE TO FACILITATE CIRCUIT TRACING OR COMPONENT REPLACEMENT AND MAY NOT NECESSARILY BE FOUND ON THE UNIT.

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

WAVEFORMS TAKEN WITH CONTROLS SET TO PRODUCE 90 VOLTS PEAK-TO-PEAK SIGNAL AT PICTURE TUBE.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltage measured at 1000 ohms per volt
2. Pin numbers are counted in clockwise direction on bottom of socket
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line Voltage maintained at 117 volts for voltage readings.
5. All controls set for normal operation, no signal applied.

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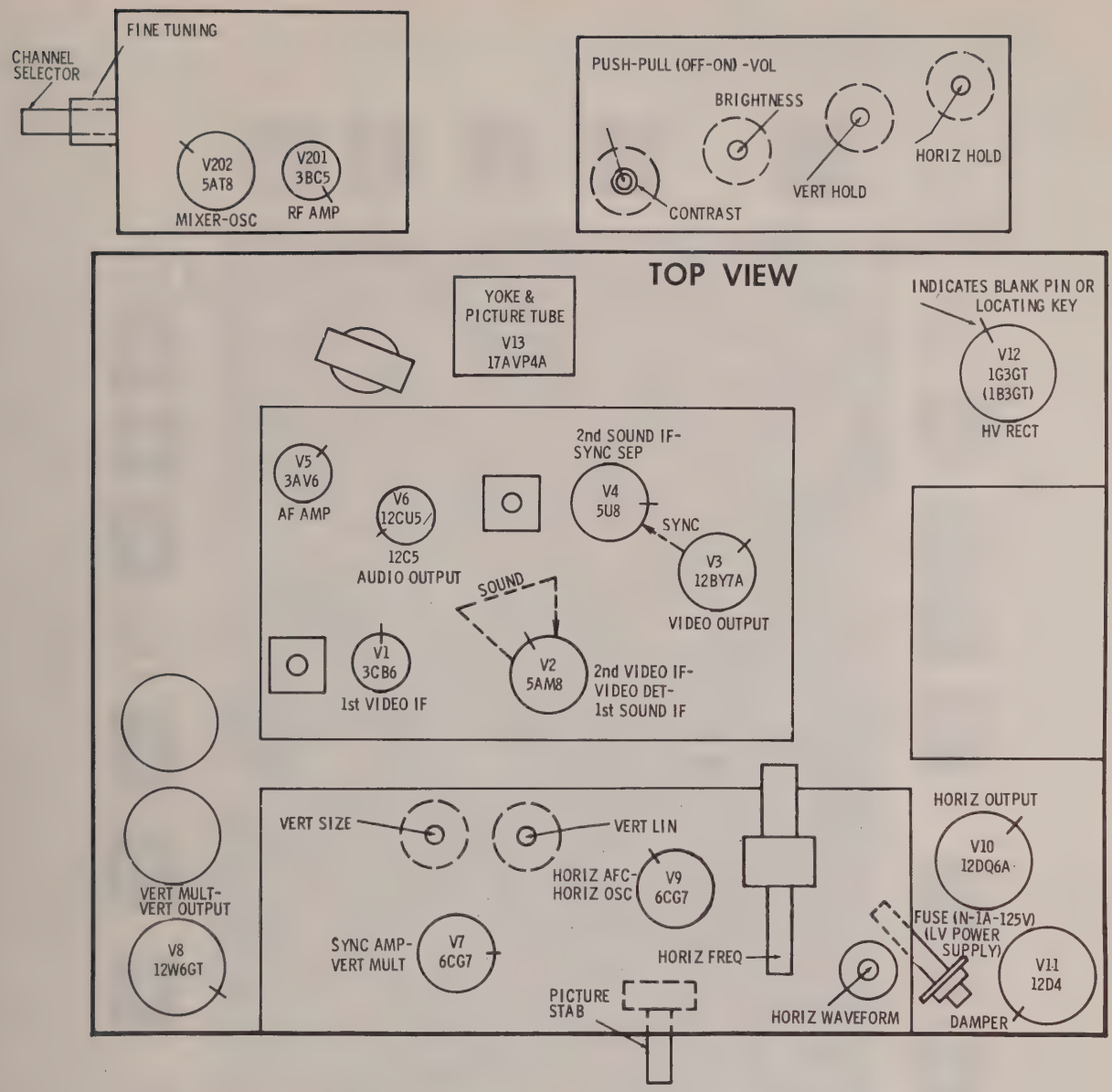
EMERSON MODELS 1500, 1502, 1503, 1504, 1505, 1506 (Ch. 120451H, HC, 120452M, MC)

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce indicated symptoms. Refer to tube placement chart for location and type of tube.

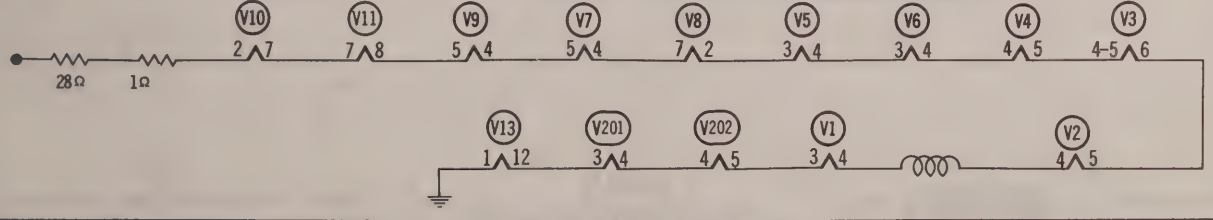
POWER SUPPLY FAILURE
No raster, no sound Fuse (B+), Rect. (B+)

SWEEP FAILURE
No raster, has sound V9, V10, V11, V12, V13, Rect. (B+)
No vertical deflection V7, V8
Poor vert. linearity or foldover V7, V8
Poor horiz. linearity or foldover V9, V10, V11
Narrow picture Rect. (B+), V9, V10, V11
Vert. off freq. V7
Horiz. off freq. V9

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster V1, V2, V3
No pic, no sound, has snow V201, V202
No pic, has sound, has raster V3, V13
Has pic, no sound V4, V5, V6

SYNC FAILURE
No vert. sync V7
No horiz. sync V9
No vert. or horiz. sync V4, V7

This receiver employs tubes used in a series filament network, an open filament in any tube will cause the set to be inoperative. (See circuit below.)

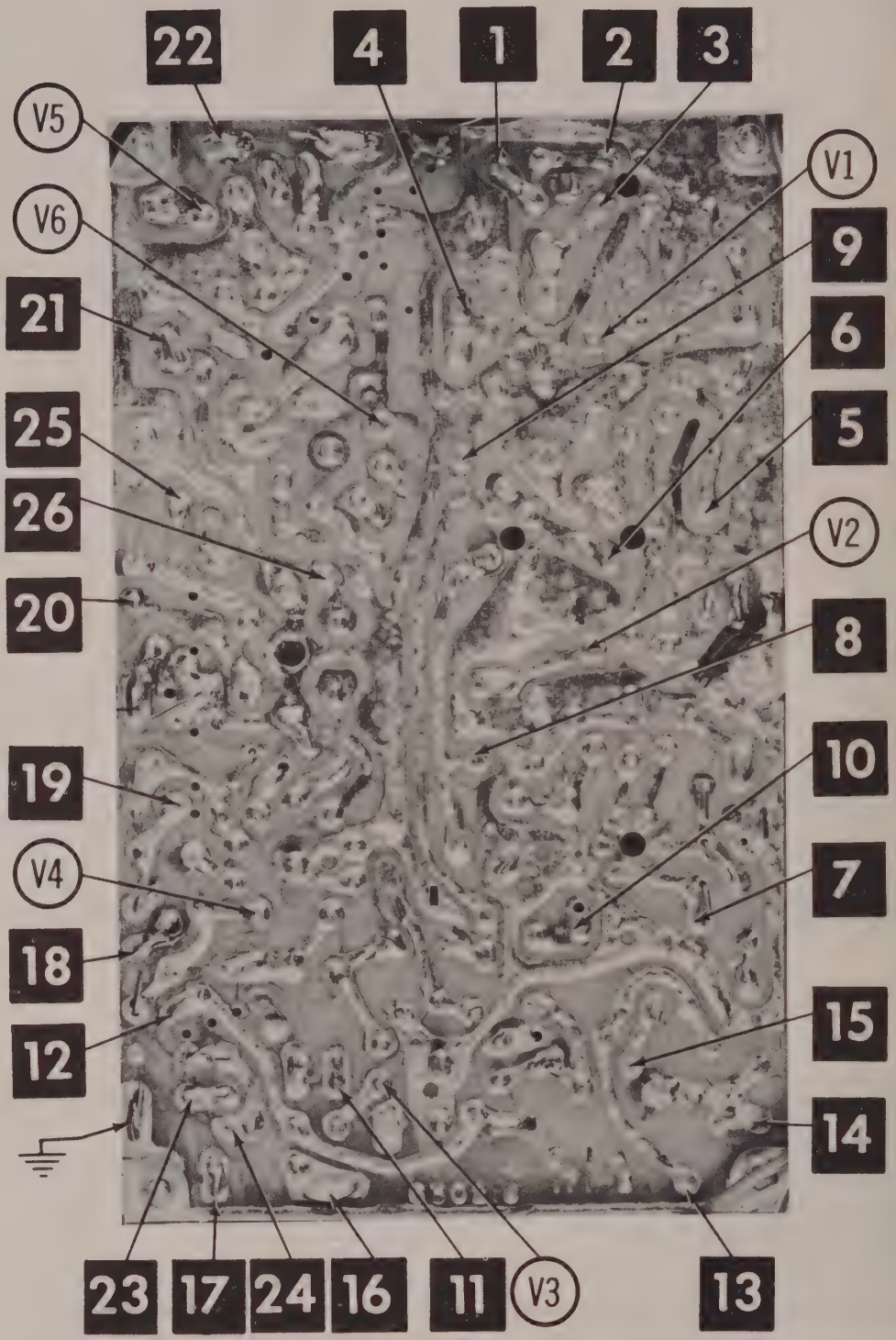


SET 456 FOLDER 2

EMERSON MODELS 1500, 1502, 1503, 1504, 1505, 1506 (Ch. 120451H, HC, 120452M, MC)

FOLDER 2

CircuiTrace Numbers 1 thru 26



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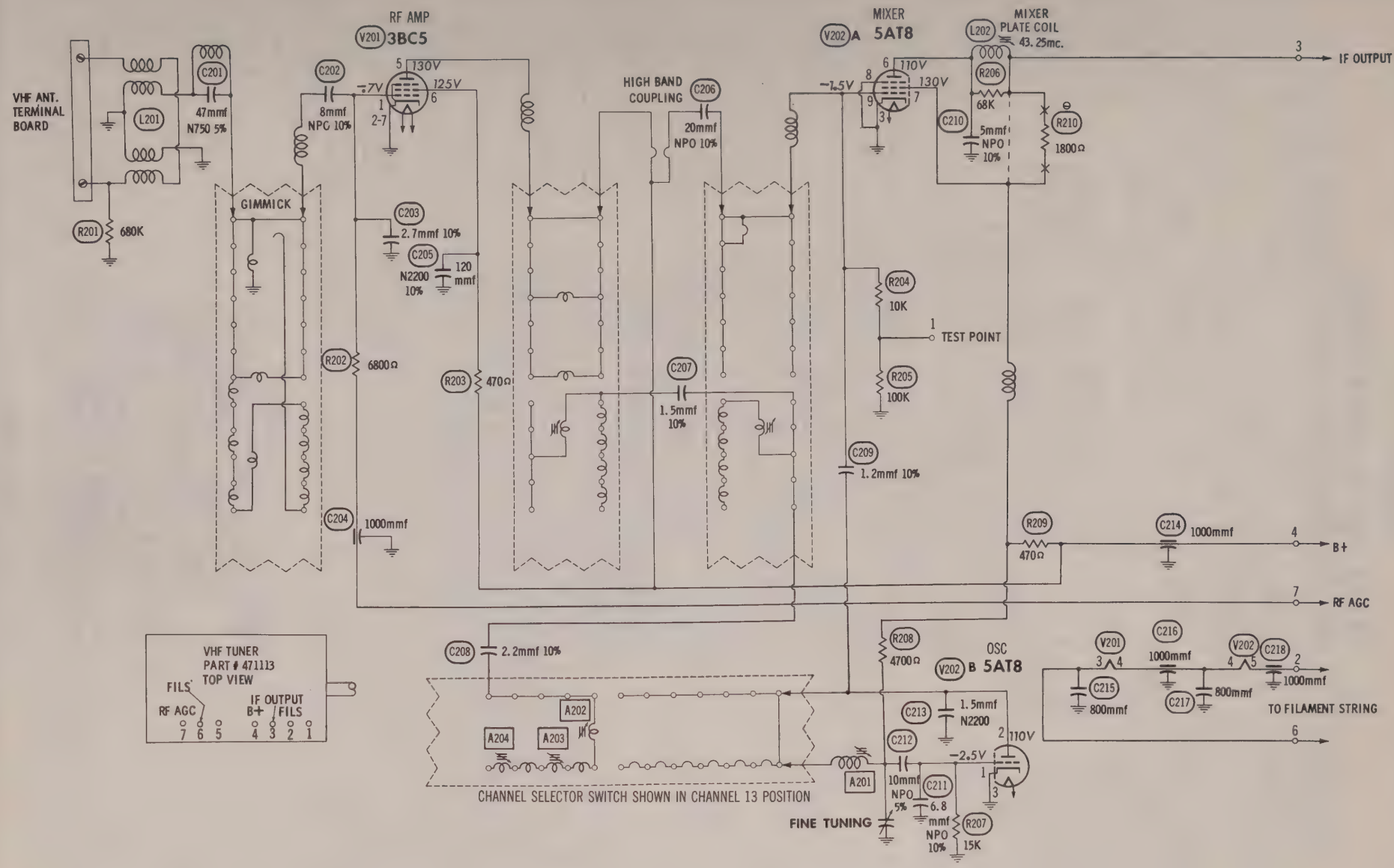
MAIN
PRINTED BOARD

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



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VHF TUNER 471113

EMERSON MODELS 1500, 1502, 1503, 1504, 1505, 1506 (Ch. 120451H, HC, 120452M, MC)

TUNER 471113

PARTS LIST & DESCRIPTION

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V201	RF Amp.	3BC5	

ITEM No.	USE	TYPE	NOTES
V202	Mixer-Osc.	5AT8	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	EMERSON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C201	47		N750 5%			DTZ-47	C10Q47U	CN7-447	5TCU-Q47S 5% *	
C202	8		NPO 10%		NPO-DI 8.2		C10V8C			
C203	2.7		10%		NPO-DI 3		C10V3C	ZT-553	5TCCB-Q27S 10%*	
C204	1000			961969	EF-001	MFT-1000			503C-D1	
C205	120		N2200 10%							
C206	20		NPO 10%		NPO-DI 20	DTZ-20	C10Q20C	ZT-542	5TCC-Q2S 10% *	
C207	1.5		10%		NPO-SI 1.5	TCZ-1R5	C10V15C	ZT-5515	5TCCB-V15S 10%*	
C208	2.2		10%		NPO-SI 2.2	TCZ-2R2	C10V22C	CNO-522	5TCCB-V22S 10%*	
C209	1.2		10%		NPO-SI 1.5	TCZ-1R5	C10V15C	ZT-5515	5TCCB-V12S 10%*	
C210	5		NPO 10%		NPO- DI 5	DTZ-4R7	C10V5C	ZT-555	5TCCB-V5S 10%*	
C211	6.8		NPO 10%		NPO-DI 6.8	DTZ-6R8	C10V68C	CNO-568	5TCCB-V68S 10%*	
C212	10		NPO 5%		NPO-DI 10	DTZ-10	C10V10C	CNO-410	5TCC-Q1S 5% *	
C213	1.5		N2200							
C214	1000			961969	EF-001	MFT-1000			503C-D1	
C215	800				BPD-0008	DD-801	L10T8	B-382	5GA-T8	
C216	1000			961969	EF-001	MFT-1000			503C-D1	
C217	800				BPD-0008	DD-801	L10T8	B-382	5GA-T8	
C218	1000			961969	EF-001	MFT-1000			503C-D1	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		EMERSON PART No.	NOTES
	OHMS	WATT		
R201	680K			
R202	6800Ω			
R203	470Ω			
R204	10K			
R205	100K			

ITEM No.	RATING		EMERSON PART No.	NOTES
	OHMS	WATT		
R206	68K			
R207	15K			
R208	4700Ω			
R209	470Ω			
R210	1800Ω			

COILS (RF-IF)

ITEM No.	USE	EMERSON PART No.	NOTES
L201	Ant. Input Assy.	962548	

ITEM No.	USE	EMERSON PART No.	NOTES
L202	Mixer Plate	961267	

ALIGNMENT INSTRUCTIONS

Suggested Alignment Tools: GENERAL CEMENT #5000, 5003, 8276, 8290
WALSCO #2512, 2525

VHF OSCILLATOR ALIGNMENT

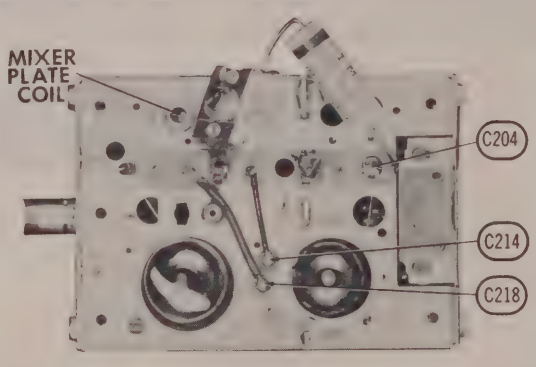
Channel 13 Oscillator adjustment slug (A201) is also used for adjusting the other high band (12 thru 7) channels. Channel 6 Oscillator adjustment slug (A202) is also adjusted for channel 5. Channel 4 Oscillator adjustment (A203) is also adjusted for channel 3. Channel 2 Oscillator slug (A204) is used only for channel 2.
Turn the set on and tune in the highest high band channel and adjust controls for normal operation. Set Fine Tuning to the center of its range. Adjust A201 for best picture and sound. Switch to next high band channel. If necessary to adjust, do so by bending coil loop appearing at the hole to left of tuner shaft for best picture and sound.
Switch channel selector to the highest low band channel (6 thru 2) operating in the area. Adjust proper slug for best picture and sound. If channel 5 or 3 require adjusting, it will be necessary to switch to the next higher channel, adjust slightly, then switch back to the channel needing adjustment and check picture. Repeat until proper results are obtained. Repeat procedure until all channel operating in the area have been properly adjusted.

VHF RF AND MIXER ALIGNMENT

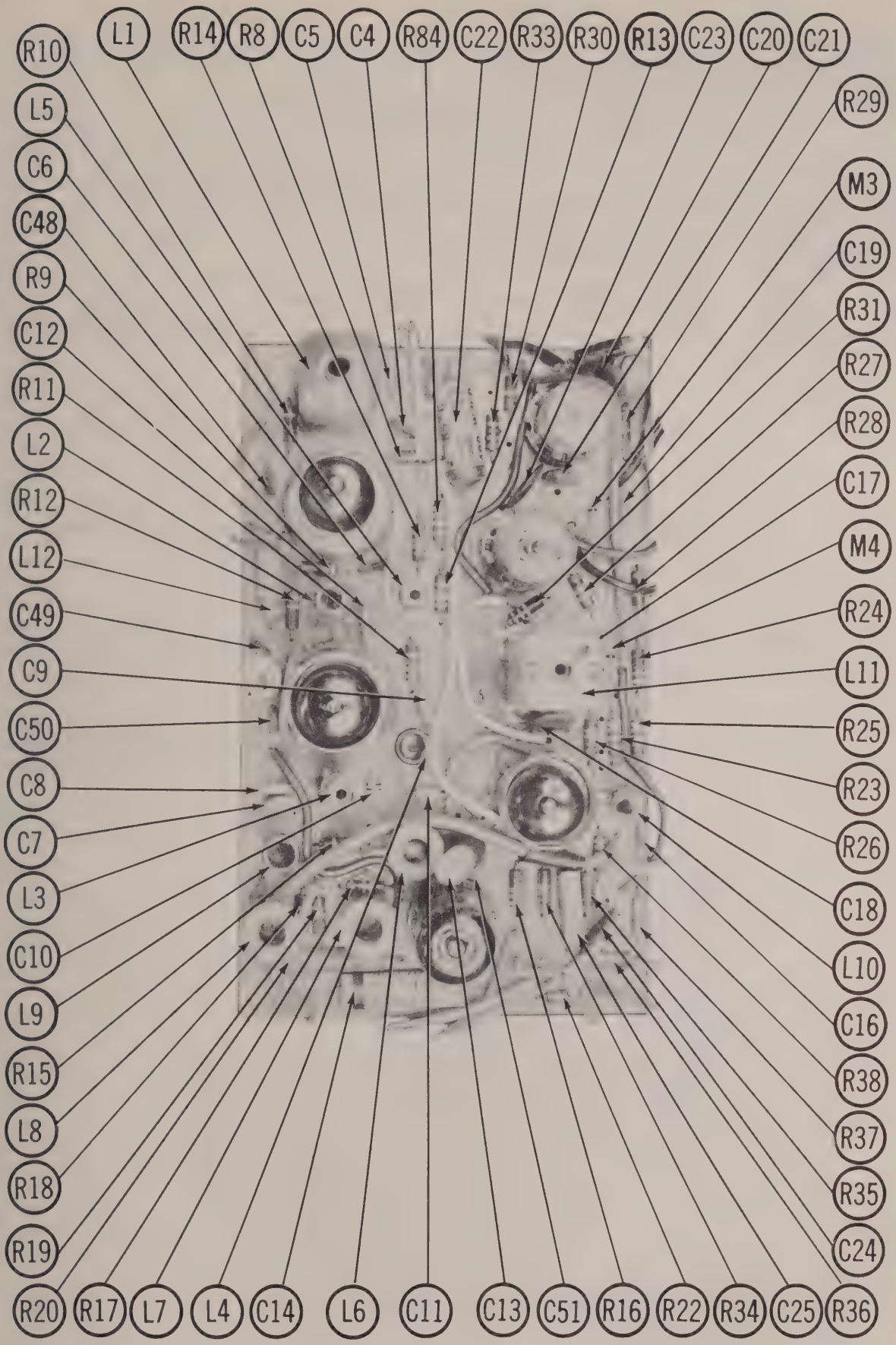
This portion of the tuner has been properly aligned at the factory and is very stable. Alignment of this portion should not be attempted in the field.

UHF ALIGNMENT

This portion of the tuner has been properly aligned at the factory and is very stable. Alignment of this portion should not be attempted in the field.



TOP VIEW



MAIN PRINTED BOARD

SET 456 FOLDER 2

ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

Use an ISOLATION TRANSFORMER TO PROTECT the Test Equipment.
The High Voltage lead should be securely taped and kept away from the chassis.
Allow a 20 minute warm-up period for the receiver and test equipment.
Suggested Alignment Tools: A1 thru A7, Mixer Plate Coil... GENERAL CEMENT #8606, 8606L, 8282, 9295
WALSCO #2526, 2543, 2544, 2545
Mixer Plate Trimmer ..... GENERAL CEMENT #5004, 5008, 5009
WALSCO #2520

VIDEO IF ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Use only enough generator output to provide a usable indication on VTVM.
Use only enough sweep generator output to provide a usable pattern on scope.
Connect the negative lead of a 3 volt bias supply to point (A). Positive to chassis.
Preset Mixer Plate Trimmer for maximum capacity.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	Place a thin insulated metal strip between the Mixer-Osc. tube (V202), and tube shield. Connect the high side of sweep generator to the metal strip. Low side to chassis.	Not used	45.5MC (Unmod)	Any non-interfering channel	USE VTVM. DC probe thru 10K to point (B). Common to chassis. (Across Video Det. load)	A1	Adjust for maximum deflection.
2.	"	"	"	43.25MC	"	"	A2, A3 & Mixer Plate Coil	"
3.	"	"	44.0MC (10MC Swp)	45.75MC	"	Vert. Amp. thru 20K to point (B). Low side to chassis.	Mixer Plate Trimmer	Adjust Mixer Plate Trimmer to place marker as in Fig. 1.

SOUND IF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
4.	.05mfd	High side to point (B). Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel	DC probe thru 1meg to point (C). Common to chassis.	A4, A5, A6	Adjust for maximum deflection.
5.	"	"	"	"	DC probe thru 1meg to point (D). Common to chassis.	A7	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

TUNER ALIGNMENT INSTRUCTIONS LOCATED ON PAGE 6

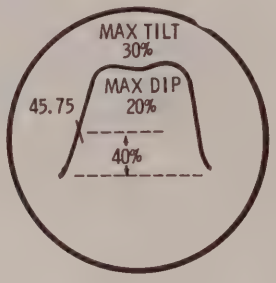
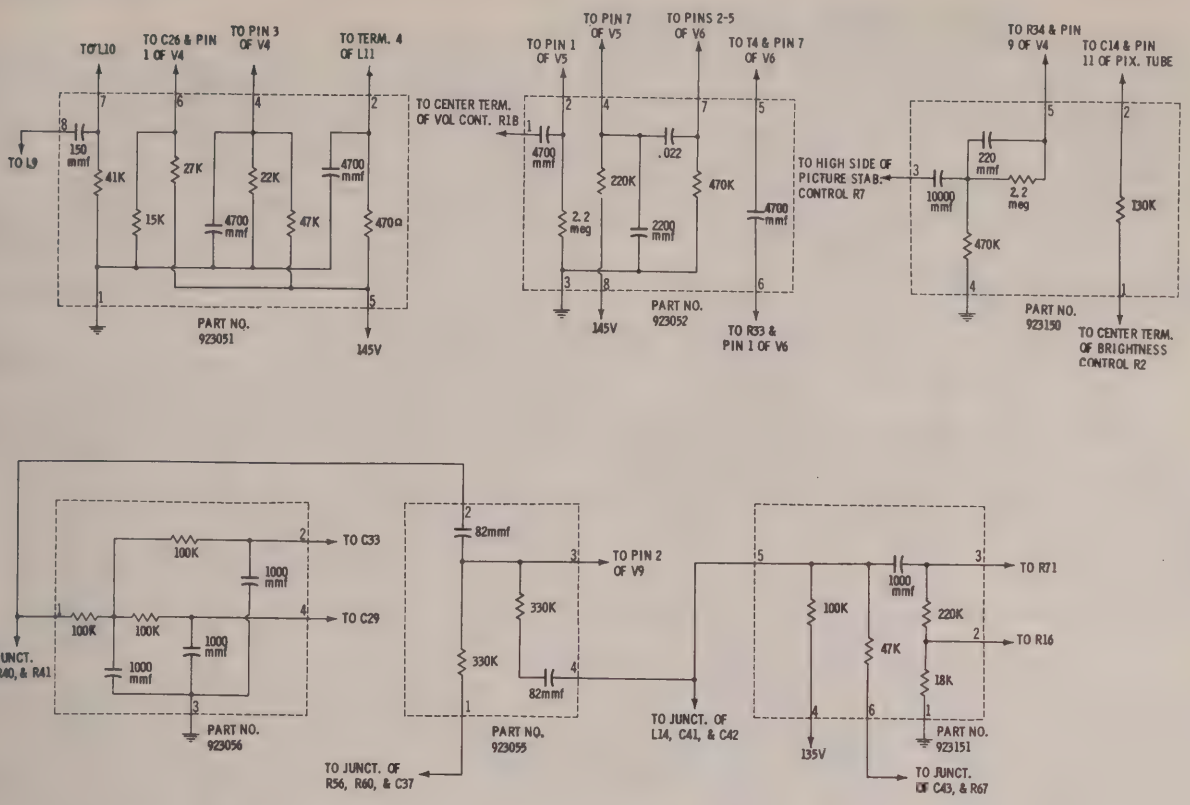


FIG.1



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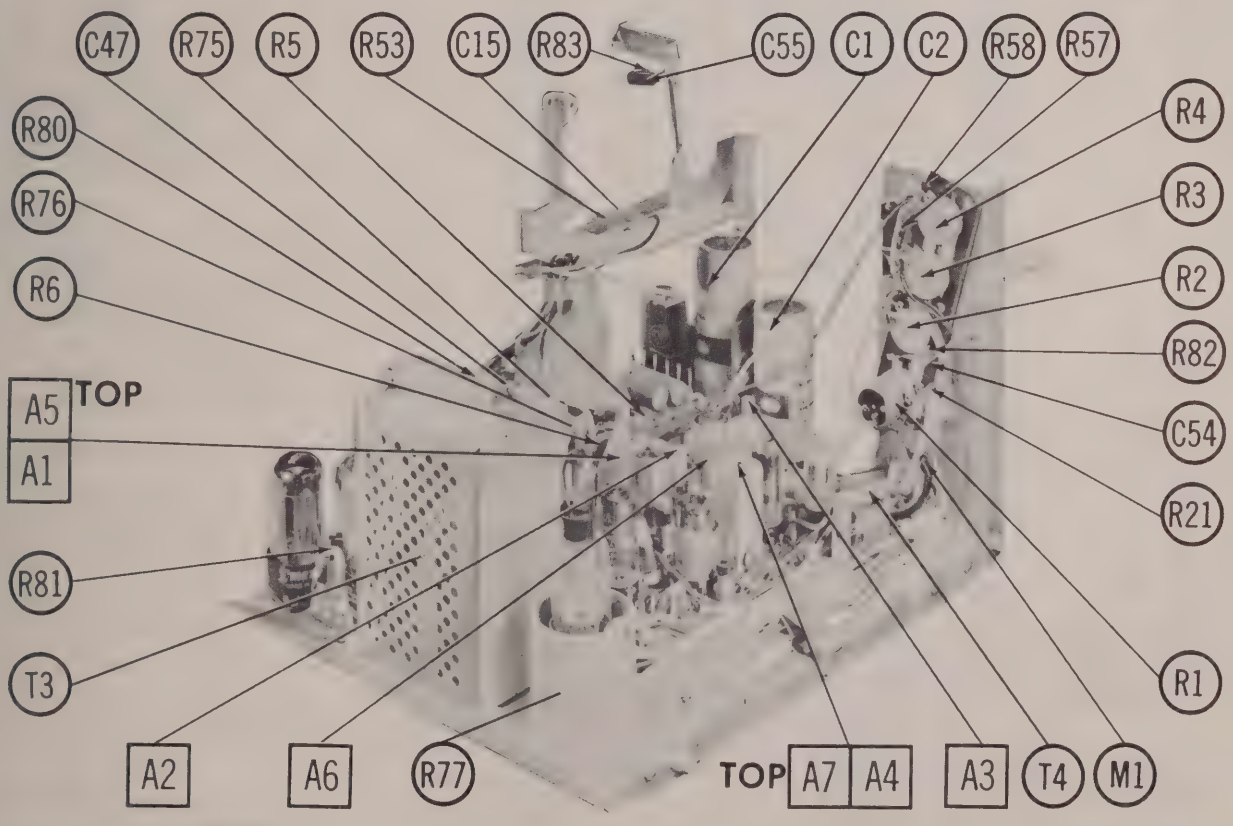
MODULE LAYOUT



CHASSIS FRONT VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	1st Video IF Amp.	3CB6	
V2	2nd Video IF Amp. - Video Det. -1st Sound IF Amp.	5AM8	
V3	Video Output	12BY7A	
V4	2nd Sound IF Amp. - Sync Sep.	5U8	
V5	AF Amp	3AV8	

ITEM No.	USE	TYPE	NOTES
V6	Audio Output	12CU5/ 13C5	
V7	Sync Amp. - Vert. Mult.	6CG7	
V8	Vert. Mult. - Vert. Output	12W6GT	
V9	Horiz. AFC-Horiz. Osc.	6CG7	
V10	Horiz. Output	12DQ6A	
V11	Damper	12D4	
V12	HV Rect.	1G3GT	1B3GT*

* Alternate.

PICTURE TUBE

ITEM No.	REPLACEMENT DATA				NOTES
	EMERSON PART No	GENERAL ELECTRIC PART No.	RCA PART No.	SYLVANIA PART No	
V13	17AVP4A	17AVP4A/ 17ATP4A ①	17AVP4-A/ ⚓ 17ATP4-A	17ATP4A/ 17ATP4A ② 17ATP4/ 17AVP4 17AVP4A ⚓ 17BJP4 ⚓ 17AV94	⚓ Aluminized ② Silver Screen "65"

ELECTROLYTIC CAPACITORS

ITEM No	RATING		REPLACEMENT DATA						
	CAP	VOLT	EMERSON PART No.	AEROVOX PART No.	CORNELL DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	250	180	925412	PRS-180	WT312			TVAS-2473*	
B	120	180							
C	50	25							
C2A	250	150	925386	PRS-043	XC0136	-WD25		TVAS-3437 6*	
B	50	150				TC496			

* Not normally in distributor's stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		TOL	REPLACEMENT DATA					NOTES
	CAP.	VOLT		EMERSON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	.1	200		924518 D	P288N-1	DF-104	CUB32P1	GEM-301	3TM-P1	
C4	1000			923833	BPD-001	DD-103	BYA10D1M	B-210	5HK-D1	
C5	1000			923819	BPD-001	DD-102	BYA10D1M	B-210	5HK-D1	
C6	750		10%	923904	DI-750	DD-751			5GA-T75	
C7	24		N330 5%	923960						
C8	1000		10%	923911	DI-1000	DD-102	1R5DI	JL-210	10TS-D10	
C9	680		10%	923909	DI-680	DD-681	1R5T68	JL-368	10TS-T68	
C10	10		10%	923816		DB-100	L10Q1	ET-541	10TS-Q10	
C11	4.7		10%	923813		TCZ-4R7	C10V47C	ZT-5547	10TCC-V47	
C12	100		N750-DI 100	TCN-100	TCN-100	C10T1U	CN7-310	10TCU-T10		
C13	.047	300		923150	P288N-047	DF-503	CUB3247	GEM-4147	3TM-S47	
C14	.047	400		924554	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C15	2200	1000		923921	BPD-022	DD-223	BYA10D22	B-222	5HK-D22	
C16	150		10%	923903	DI-150	DD-151	L10T15	JL-215	10TS-T15	
C17	4700			923933	BPD-047	DD-472	BYA10D47M	B-247	5HK-D47	
C18	4700			923923	BPD-047	DD-472	BYA10D47M	B-247	5HK-D47	
C19	1000			923819	BPD-001	DD-102	BYA10D1M	B-210	5HK-D1	
C20	4700			923923	BPD-047	DD-472	BYA10D47M	B-247	5HK-D47	
C21	2200			923921	BPD-022	DD-223	BYA10D22	B-222	5HK-D22	
C22	.022	400		923534	P488N-022		CUB4S22	GEM-4122	4TM-S22	
C23	4700	1000		923954	BPD-047	DD-472	BYA10D47M	B-247	5HK-D47	
C24	10000			923924	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C25	220			911S4	1466-00022	TCZ-220	5W5T22		1FM-322	
C26	.01	400		923514	P488N-01	DD-103	CUB4S1	GEM-411	4TM-S1	
C27	1000			923819	BPD-001	DD-103	BYA10D1M	B-210	5HK-D1	
C28	1000			923819	BPD-001	DD-103	BYA10D1M	B-210	5HK-D1	
C29	.0047	400		924483 T	P488N-0047	DB-472	CUB5D47	GEM-4247	4TM-D47	
C30	.1	400		924518	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C31	.1	400		924515	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C33	1000			923930	BPD-001	DD-102	BYA10D1M	B-210	5HK-D1	
C33	.01	400		924514	P488N-01	DB-103	CUB4S1	GEM-411	4TM-S1	
C34	82			911S0	1466-00082	DB-820	5W5Q82	CNO-482	1FM-482	
C35	82			911S0	1466-00082	DB-820	5W5Q82	CNO-482	1FM-482	
C36	.047	400		923554	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C37	.047	300		924354	P288N-047	DF-503	CUB3247	GEM-4147	3TM-S47	
C38	.022	400		923534	P488N-022		CUB4S22	GEM-4122	4TM-S22	
C39	.47	300		923355	P288N-47		CUB3P47	GEM-3047	3TM-P47	
C40	330			911S7	1466-00033	DD-331	5W5T33		1FM-322	
C41	.01	600	10%	924514T	V84C6S1 10%		PM6S1	GTM-611	6TM-S1	
C43	820			911S8	1466-00082	D6-821	5W5T82		1GT5-T82	
C43	.1	400		924515D	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C44	.001	400		924513	P488N-001	D6-102	CUB6D1	GEM-421	6TM-D1	
C45	.01	400		923514	P488N-01	D6-103	CUB4S1	GEM-411	4TM-S1	
C46	.1	400		924515D	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C47	140	4000	10%	929001					50TCY-T15	
C48	1000			923933	BPD-001	DD-102	BYA10D1M	B-210	5HK-D1	
C49	1000			923833	BPD-001	DD-103	BYA10D1M	B-210	5HK-D1	
C50	1000			923933	BPD-001	DD-102	BYA10D1M	B-210	5HK-D1	
C51	1000			923833	BPD-001	DD-103	BYA10D1M	B-210	5HK-D1	
C52	.1	200		923831	P288N-1	DF-104	CUB32P1	GEM-301	3TM-P1	
C53	.047	600		922306	P688N-047	DF-503	CUB6S47	GEM-4147	6TM-S47	
C54	1000	1000		923927	BPD-001	DD-102	BYA10D1M	B-210	5HK-D1	
C55	.01	400		923501	P488N-01	DB-103	CUB4S1	GEM-401	4TM-S1	
C56	50-380			900185						

① Ch. 120451SC & 120452MC use a component combination in this application (Part #923051).
② Ch. 120451SC & 120452MC use a component combination in this application (Part #923052).
③ Ch. 120451SC & 120452MC use a component combination in this application (Part #923150).
④ Ch. 120451SC & 210452MC use a component combination in this application (Part #923056).
⑤ Ch. 120451SC & 120452MC use a component combination in this application (Part #923055) with C35 and R54 connections reversed.
⑥ Ch. 130451SC & 130452MC use a component combination in this application (Part #923151).

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	EMERSON PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	600Ω	½	390574	F3-2	RTV-641	■ QJ-1062	▲ UE3763-S	Contrast
B	1meg	½		R3-52	Not Req.			Volume
C	Switch			KR-1	Not Req.			Off-On
R2A	200K	½	390573	B-46	A47-200K-S	QJ1-129	U43	Brightness
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	EMERSON PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R3A	1.5meg	½	390572	B-742	A47-1.5meg-S	QJ1-128	U165	Vert. Hold
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R4A	500K	½	390571	B-59	A47-500K-S	QJ1-133	U80	Horiz. Hold
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R5	2meg	½	390403					Vert. Size
R6	500Ω	½	390405					Vert. Lin.
R7A	100K	½	390455	AB-40	H47-100K-S	QJ1-128	PTA15L	Picture Stabilizer
B	Shaft			AK-19	Not Req.	TQ	Not Req.	

■ "Concentrikit" Equivalent: K-6 Kit with Base Elements & Shafts: B17-105, P17-028 (Panel) B13-137, R1-108 (Rear) 76-1 (Switch)

▲ "STA-LOC" Equivalent: FA62R, RU16A, OF875, IK1312, U341.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		EMERSON PART No	NOTES
	OHMS	WATT		
R8	1000Ω		350492	
R9	470Ω		350412	
R10	56Ω		340182	
R11	180Ω		340312	
R12	470Ω		350412	
R13	3900Ω		340632	
R14	27K		340782	
R15	8200Ω		340712	
R16	470K		351132	
R17	10K		340732	
R18	4700Ω		340652	
R19	15K		340772	
R20	5600Ω	2	397102	
R21	22Ω		340092	
R22	120K		340992	Note 1
R23	47K		340892	Note 2
R24	470Ω		350412	Note 2
R25	47K		340892	Note 2
R26	22K		340812	Note 2
R27	100K		340972	
R28	100K		340972	
R29	2.2meg		351292	Note 3
R30	220K		351052	Note 3
R31	470K		351132	Note 3
R32	4700	2	390412	
R33	180Ω		340312	
R34	22meg		341534	
R35	2.2meg		351292	Note 1
R36	470K		351132	Note 1
R37	15K		340772	Note 2
R38	27K		340832	Note 2
R39	1meg		351213	
R40	10K		340732	
R41	3300Ω		340512	
R42	100K		340972	Note 4
R43	100K		340972	Note 4
R44	100K		340972	Note 4
R45	560K		341152	
R46	2.2meg		341294	

ITEM No.	RATING		EMERSON PART No	NOTES
	OHMS	WATT		
R47	2.2meg		341294	
R48	2.2meg		351294	
R49	100Ω		350252	
R50	220Ω		340332	
R51	680Ω		350452	
R52	680Ω		350452	
R53	10K		340732	
R54	330K		341092	Note 5
R55	330K		341092	Note 5
R56	1.5meg		341252	
R57	150K		341012	
R58	470K		351132	
R59	82K		340952	
R60	820K		341192	
R61	220K		341052	
R62	3900Ω		340732	
R63	150K		341012	
R64	2.2meg		341294	
R65	8200Ω		340712	
R66	100K		340972	Note 6
R67	22K		340812	
R68	47K		340892	Note 6
R69	18K		340792	Note 6
R70	220K		341052	Note 6
R71	100Ω		350252	
R72	680Ω	1	370453	
R73	220Ω		340332	
R74	180K		341032	
R75	4700Ω		340532	
R76	10Ω		340012	
R77	3.9Ω		394149	
R78	120Ω	1	370272	
R79	5Ω	5	394158	
R80	28Ω	15	397129	
R81	1Ω		397103	
R82	220K		351057	
R83	220K		351057	
R84	470K		341152	

Note 1. Ch. 120451SC & 120452MC use a component combination in this application (Part #923150) & R22 becomes 130K.
Note 2. Ch. 130451SC & 130452MC use a component combination in this application (Part #923051) & R23 becomes 41K.
Note 3. Ch. 130451SC & 120452MC use a component combination in this application (Part #923052).
Note 4. Ch. 130451SC & 120452MC use a component combination in this application (Part #923056).
Note 5. Ch. 130451SC & 120452MC use a component combination in this application (Part #923055) & R54 & C35 are reversed.
Note 6. Ch. 120451SC & 120452MC use a component combination in this application (Part #923151).

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA							
		EMERSON PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Rogers PART No.	Stancor PART No	Thordorson PART No.	Triad PART No
T1	Vert. Output	738161	26870	A-2622 ①				26870	A-117X
T2	Yoke-Horiz. (24MH) (90°)-Vert. (35MH) Rear Cover & Centering Device Yoke Clamp	708353 / 708354 / 567191							
T3	Horiz. Output	738160	FLY-141 *	HVO-87 *	X138 *		HO-294 *	FLY-141 *	D-123 *

① Drill new mounting hole(s).

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

	ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	Ram Replacement Connections	Rogers Replacement Connections	Stancor Replacement Connections	Thordorson Replacement Connections	Triad Replacement Connections
	4	4	4	4		4	4	4
	7	8	8	8		8	8	8
	6	7	7	7		7	7	5
	2	2	2	2		2	2	2
	1	1	1	1		1	1	1
Special Notes →								②

② Do not use terminal #6 as a tie point.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	EMERSON PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordorson PART No.	Triad PART No.	
T4	2100Ω	3-4Ω	734178	24853	A-3025	AU-605	A-3332	24853	S-12X	

SPEAKER

ITEM No.	TYPE				REPLACEMENT DATA		NOTES
	SIZE	FIELD	V C	IMP	EMERSON PART No	QUAM PART No	
SP1	4"	PM	3-4Ω		180154A	4A1	

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA						NOTES
		EMERSON PART No.	Gramer PART No.	Meissner PART No.	Merit PART No.	Miller PART No	Ram PART No	
L1	1st Video IF	720304						
L2	2nd Video IF	720306						
L3A	3rd Video IF	720341						
B	2nd Sound IF							
L4	RF Choke	708312		19-1005	19-1005	BC-568	4612	11uh
L5	1st Sound IF	720305						
L6	Shunt Peaking Coil	708274		19-3360	19-3360	TV-260	6148	660uh
L7	Series Peaking Coil	708273		19-3300	19-3300	TV-190	6132	VP-7 330uh
L8	Shunt Peaking Coil	708274		19-3360	19-3360	TV-206	6148	660uh
L9	RF Choke	708312		19-1005	19-1005	BC-566	4612	11uh
L10	RF Choke	708271		19-1003	19-1003	BC-554	4608	4.6uh
L11	Discriminator	708276						
L12	Fil. Choke	705033		19-1001	19-1001	BC-562	4604	1.5uh ⚓

⚓ IRC Part #CLA.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES.		REPLACEMENT DATA						NOTES
	PRI	SEC	EMERSON PART No.	Halldorson PART No.	Merit PART No.	Miller PART No.	Ram PART No	Thordorson PART No	
L13	121Ω		716117		TV-166	6112			Horiz. Osc. Tapped ② 88Ω Horiz. Waveform
L14	37Ω		708275						

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA							NOTES
	CURRENT (Measured)	DC RES	INDUCTANCE (0 CURRENT 1000 ^\)	EMERSON PART No	Halldorson PART No	Merit PART No	Ram PART No	Stancor PART No	Thordorson PART No	Triad PART No	
L15	.260A	22Ω	.5 Hy.	737033						C-27X	

RECTIFIERS

ITEM No.	RATING	REPLACEMENT DATA					NOTES
	CURRENT (Measured)	EMERSON PART No.	FEDERAL PART No	INTERNATIONAL PART No	SARKES TARZIAN PART No	SYLVANIA PART No.	
M1	.295A	817068 ⚓	TV500 ⚓	HA504 ⚓	40K ⚓	SR500 ⚓	⚓ Silicon Type.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA						NOTES
			EMERSON PART No.		LITTELFUSE PART No.		BUSS PART No.		
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER	
M2	N	1A 125V 8/B	808014		333001. (N-1A-125V-8/B)	346011	N 1	HM 3/4 to 1 1/4	

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		EMERSON PART No.	CBS PART No.	SYLVANIA PART No.	
M3		817018 ①	1N90	1N295	Discriminator (Pigtail)
M4		817018 ①	1N90	1N195	Discriminator (Pigtail) ① Alternate Part #817065.

MISCELLANEOUS

ITEM No.	PART NAME	EMERSON PART No.	NOTES
M5	Tuner	471113	VHF Ch. 120451H, HC
	Tuner	471141	UHF-VHF Ch. 120452M, MC
	Ion Trap	708316	
	Printed Board	471047	Main, Complete
	Printed Board	471083	Sweep, Complete

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

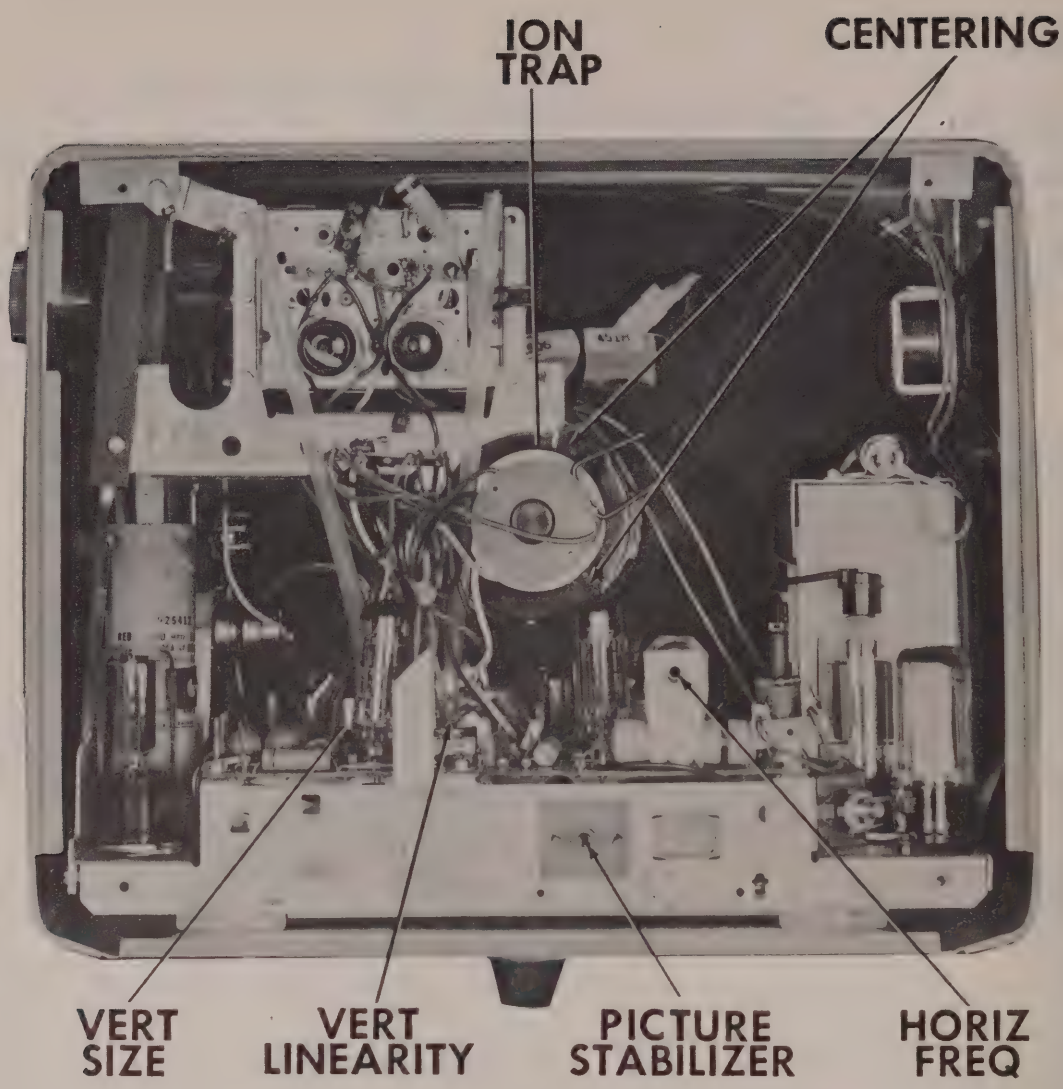
NAME	PART NO	DESCRIPTION
Safety Glass	460804	
Knob	460821	VHF Channel Selector, Models 1500, 1502, 1504, 1506
Knob	460839	VHF Channel Selector, Model 1503
Knob	461067	VHF Channel Selector, Model 1505
Knob	461065	UHF Channel Selector, Models 1503, 1505
Knob	460830	VHF Fine Tuning, All Models
Knob	461066	UHF Fine Tuning, Models 1503, 1505
Knob	461057	Volume
Knob	461056	Brightness, Vert. Hold, Horiz. Hold
Knob	460823	Contrast
Antenna	471148	Telescoping
UHF Loop	700136	

WIRING DATA

High Voltage Lead	Use BELDEN No. 8869
Shielded Hook-up Wire	Use BELDEN No. 8885 (Single Conductor) 8738 (Two Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord (Interlock Type)	Use BELDEN No. 8871
300Ω Tuner Input Lead	Use BELDEN No. 8225
300Ω Antenna Lead-in	Use BELDEN No. 8230 or 8275
Antenna Rotor Cable	Use BELDEN No. 8484 (Flat) or 8484 (Round) - 4 Conductor 8485 (Round) - 5 Conductor 8488 (Round) - 8 Conductor

EMERSON MODELS 1500, 1502, 1503, 1504, 1505, 1506 (Ch. 120451H, HC, 130452M, MC)

FOLDER 2



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Connect a clip lead across the Horizontal Waveform coil (L14).

Turn the Picture Stabilitzer control (R7) fully clockwise and tune to a known station.

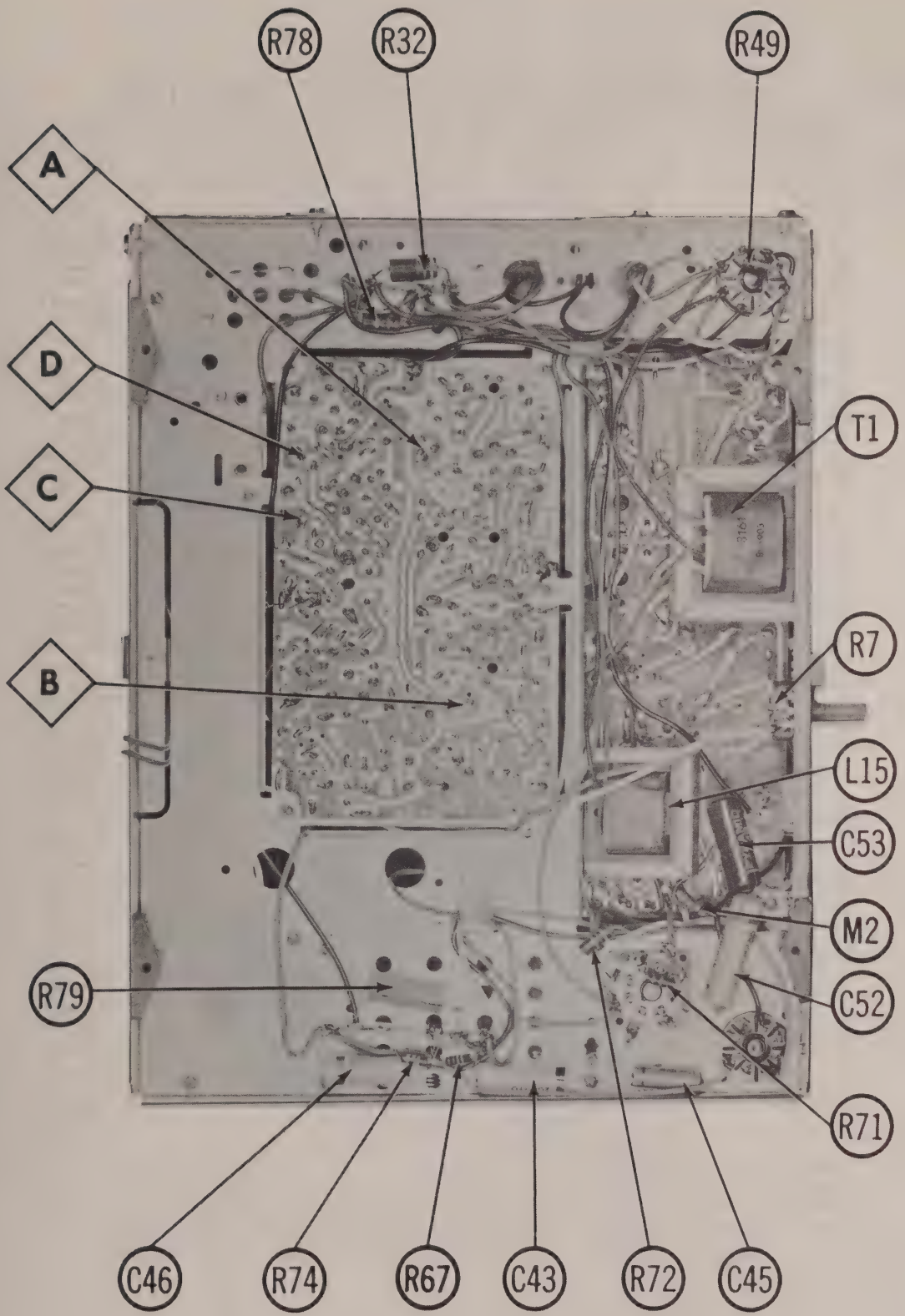
Set the Horizontal Hold control two-third clockwise.

Starting with the Horizontal Frequency slug (B1) fully counterclockwise, rotate clockwise until the picture just locks into sync.

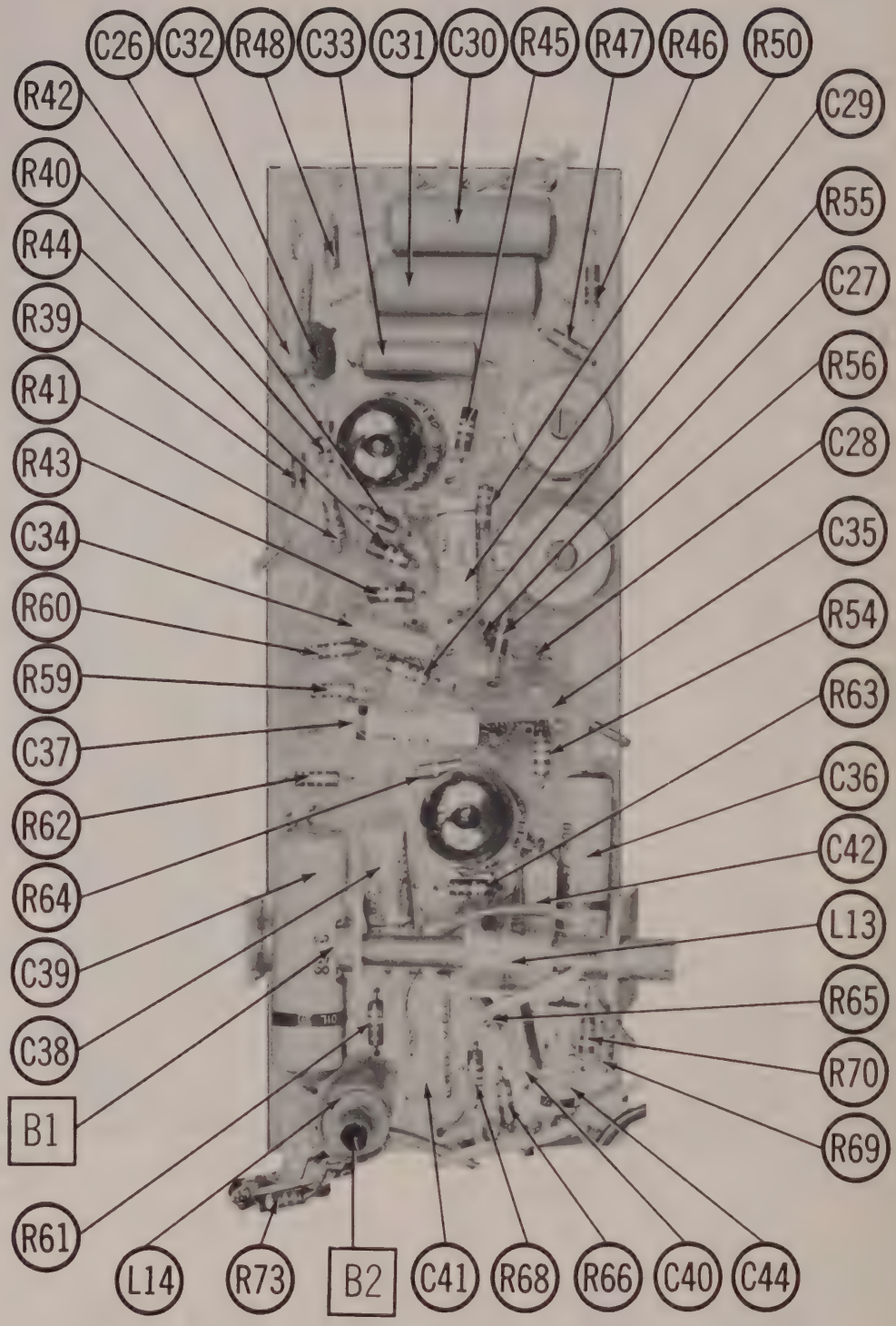
Remove the clip lead from L14 and starting with the Horizontal Waveform slug (B2) fully counterclockwise; then turn slug clockwise until the picture locks in sync.

Turn the Horizontal Hold control counterclockwise until the picture locks in and then back to full clockwise. If the picture falls out of sync, adjust B1 slightly.

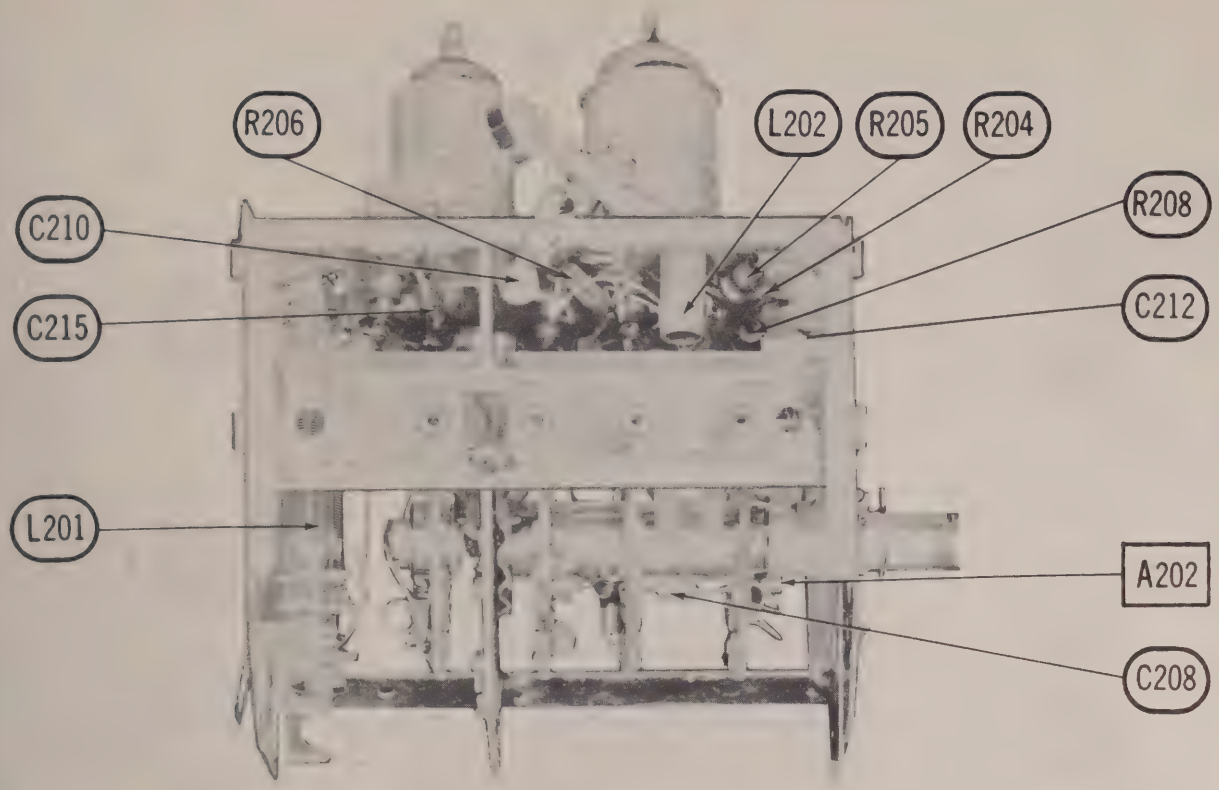
Check for Horizontal Stability while switching channels. If good hold action is not obtained at fully clockwise position of the Horizontal Hold control, turn B1 slightly until desired results are obtained. If excessive squedging (Christmas Tree effect) is experienced while switching channels, readjust B2 SLIGHTLY. Check to make sure no horizontal bending is introduced at the top of the picture.



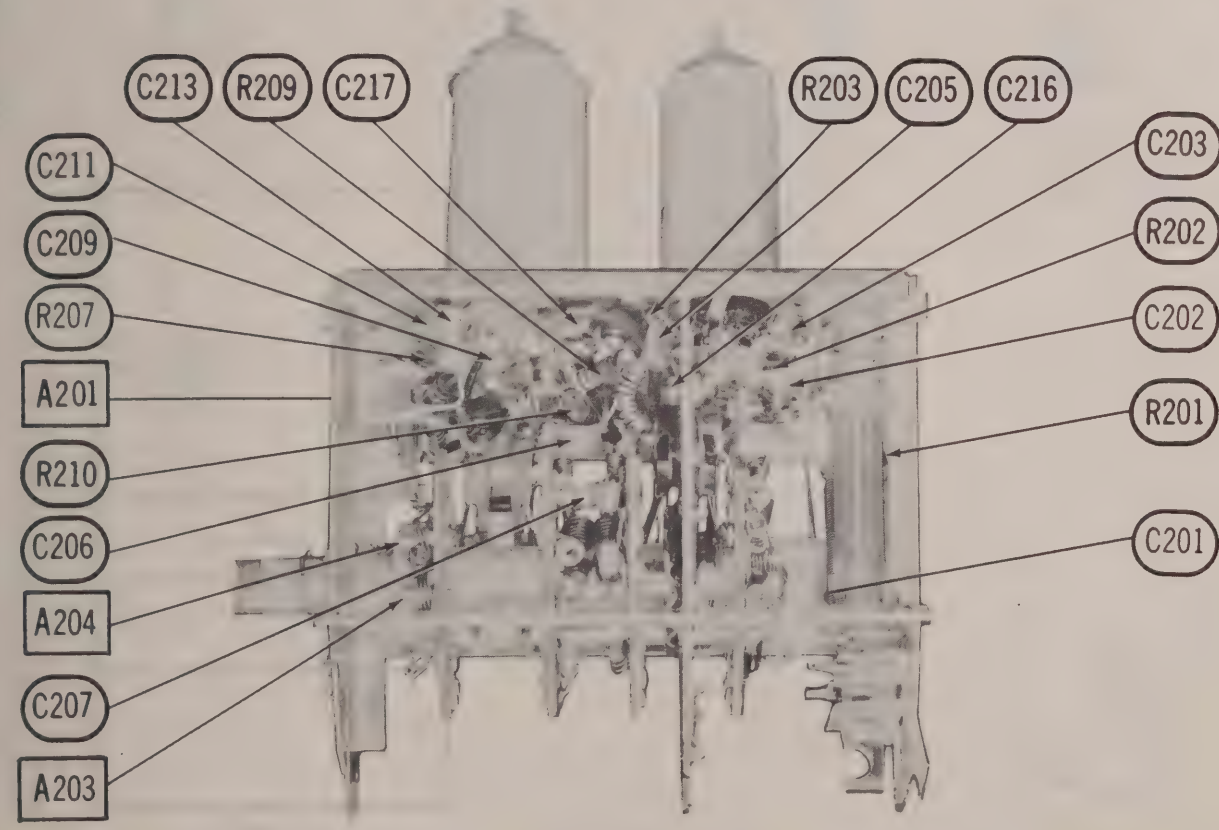
CHASSIS BOTTOM VIEW



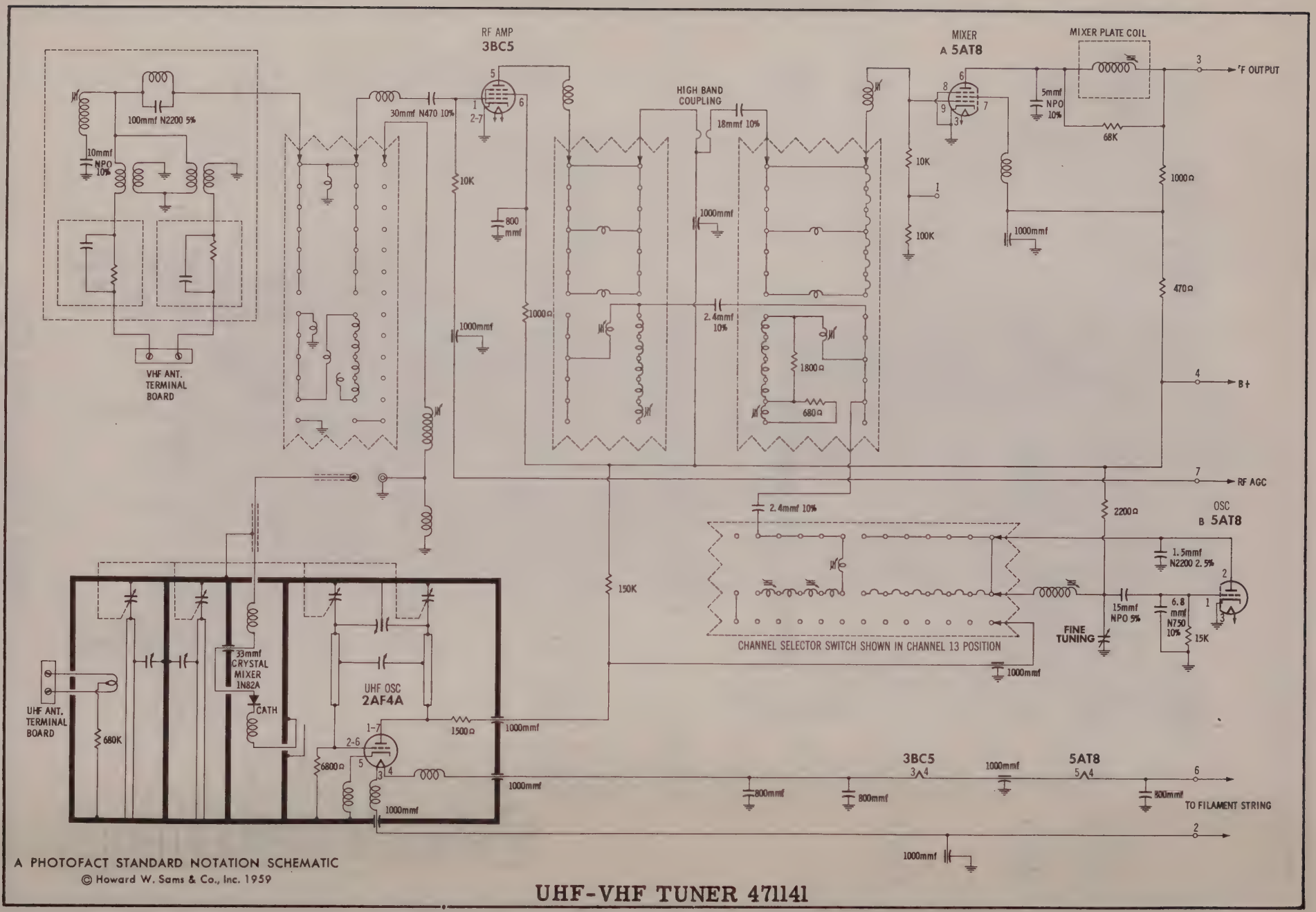
SWEEP PRINTED BOARD



TUNER 471113 - LEFT SIDE



TUNER 471113 - RIGHT SIDE



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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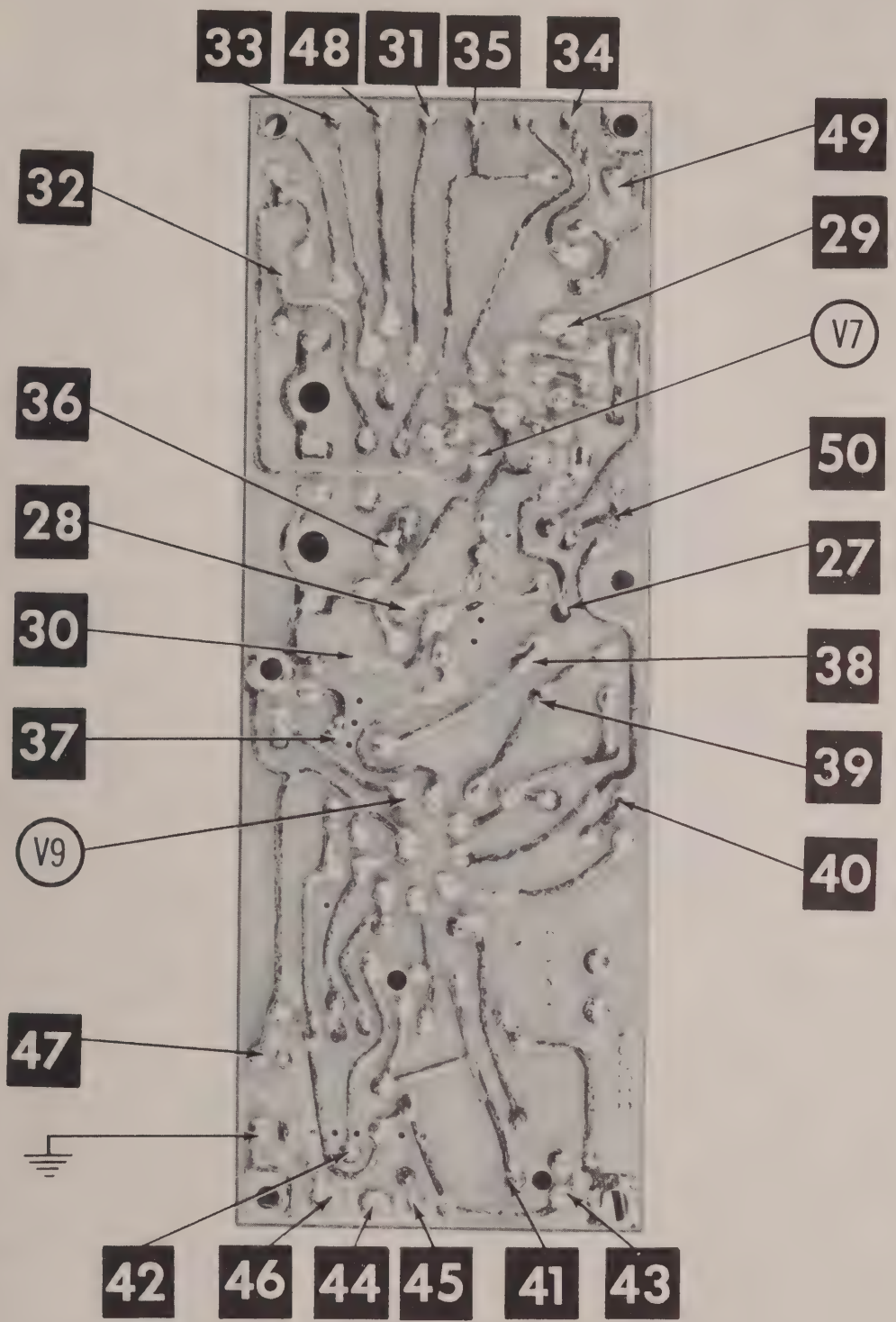
UHF-VHF TUNER 471141



A Howard W. Sams CIRCUITRACE® Photo

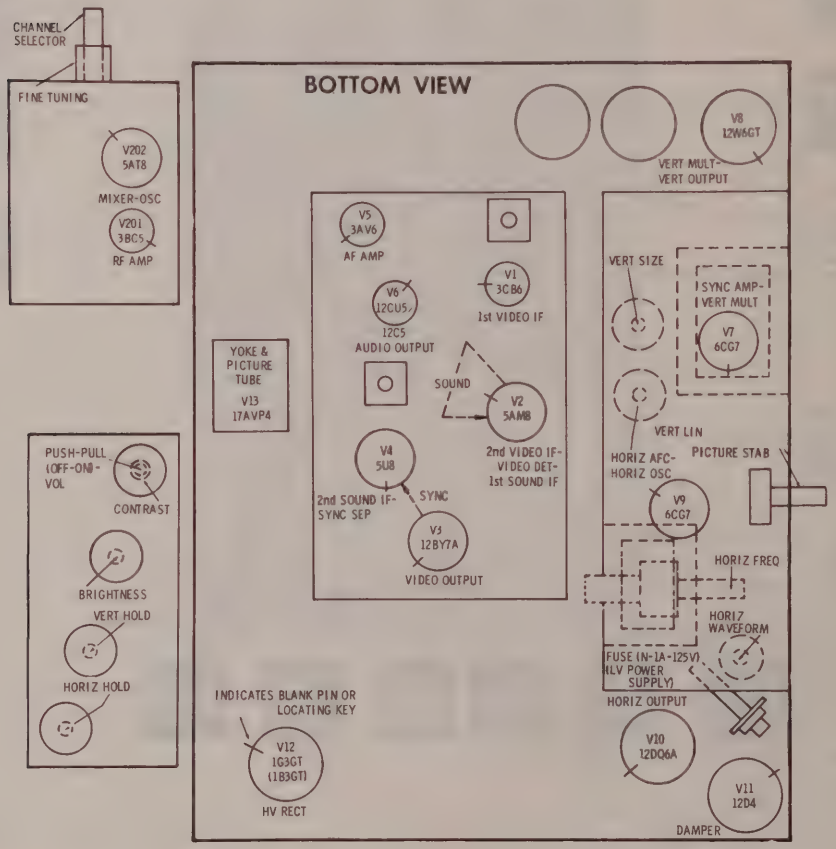
SWEEP
PRINTED BOARD

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED

RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	3CB6	475K	56Ω	3Ω	3.5Ω	†590Ω	†590Ω	0Ω		
V2	5AM8	180Ω	1.9Ω	†590Ω	3.5Ω	5Ω	†590Ω	.1Ω	8200Ω	0Ω
V3	12BY7A	• 60Ω	490K	0Ω	6Ω	6Ω	5Ω	†5600Ω	†0Ω	0Ω
V4	5U8	†15K	45K	15K	7Ω	6Ω	†470Ω	0Ω	0Ω	2.7meg
V5	3AV6	2.2meg	0Ω	10Ω	9Ω	0Ω	0Ω	†220K		
V6	12CU5/ 12C5	180Ω	470K	9Ω	7Ω	470K	†490Ω	†650Ω		
V7	6CG7	• †2.7meg	• 1meg	0Ω	12Ω	13.5Ω	†13K	†1meg	0Ω	NC
V8	12W6GT	NC	10Ω	†230Ω	†120Ω	2.2meg	TP	12Ω	• 300Ω	
V9	6CG7	†200K	1.8meg	270K	13.5Ω	15Ω	†100K	370K	0Ω	0Ω
V10	12DQ6A	TP	20Ω	TP	†170Ω	240K	NC	17Ω	0Ω	TOP CAP †19Ω
V11	12D4	NC	NC	¶140K	NC	†0Ω	NC	17Ω	15Ω	
V12	1G3GT		PINS	1 THRU 8	HAVE	INFINITE	RESISTANCE			TOP CAP †390Ω
V13	17AVP4A	0Ω	10K	Pin 6 †0Ω	Pin 10 †180K	Pin 11 •150K	Pin 12 1Ω			
V201	3BC5	470K	0Ω	1Ω	1.5Ω	†120Ω	†590Ω	0Ω		
V202	5AT8	15K	†5200Ω	0Ω	1.5Ω	3Ω	†2300Ω	†590Ω	0Ω	100K
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
• THIS READING WILL VARY. CONTROL SET FOR NORMAL OPERATION.
† MEASURED FROM 145V SOURCE.
† MEASURED FROM PIN 3 OF V11.
NC NO CONNECTION.
TP TIE POINT.



TUBE PLACEMENT CHART

PHOTOFACT* Folder

*TRADE MARK

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

**PRODUCTION CHANGE
BULLETIN 225**

SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 1 IN SET 426

Packard-Bell Models 21C1, 21C2, 21T1, 24C1 (Ch. 88-5) were covered in PHOTOFACT Folder 1 - Set 426.

Model 21K1S (Ch. 88-6) is electrically identical to the models covered except for the following changes.

COMPONENT CHANGES

R1A, B, C (Volume, Contrast, Switch) are omitted. A single contrast control with switch (Part #25981) is used in Ch. 88-6. The volume control (Part #25072) is a part of FM-AM Tuner 7TU1.

L13 (Horiz. Osc.) is changed to Part #29698A.

T5 (Audio Output) is changed to Part #89460A.

One 4" PM Speaker (Part #83110) is used.

One 4" PM Speaker (Part #83111) is used.

One 10" PM Speaker (Part #83711) is used.

AUDIO OUTPUT CIRCUIT REVISED

A revised audio output circuit is used in Ch. 88-6 which is used with Tuner 7TU1. A partial schematic showing the revised circuit is given below.

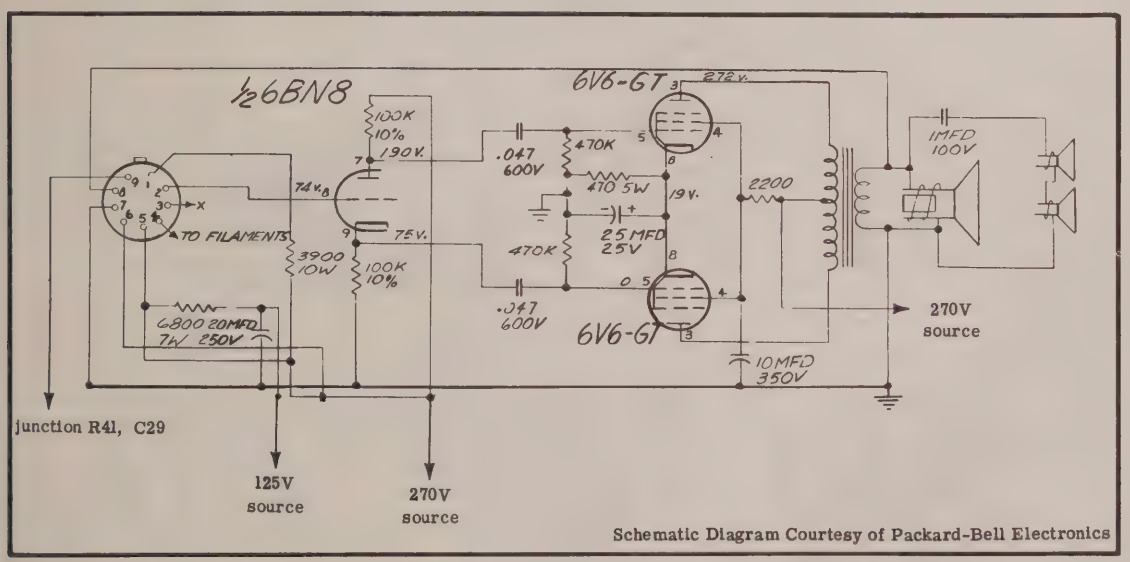
FM-AM TUNER ADDED

FM-AM Tuner 7TU1 is added. A schematic showing the new tuner, along with alignment data, is given in this bulletin.

PACKARD-BELL MODEL 21K1S (CH. 88-6)

PRODUCTION CHANGE
BULLETIN 225

PRODUCTION CHANGE
BULLETIN 225



Schematic Diagram Courtesy of Packard-Bell Electronics

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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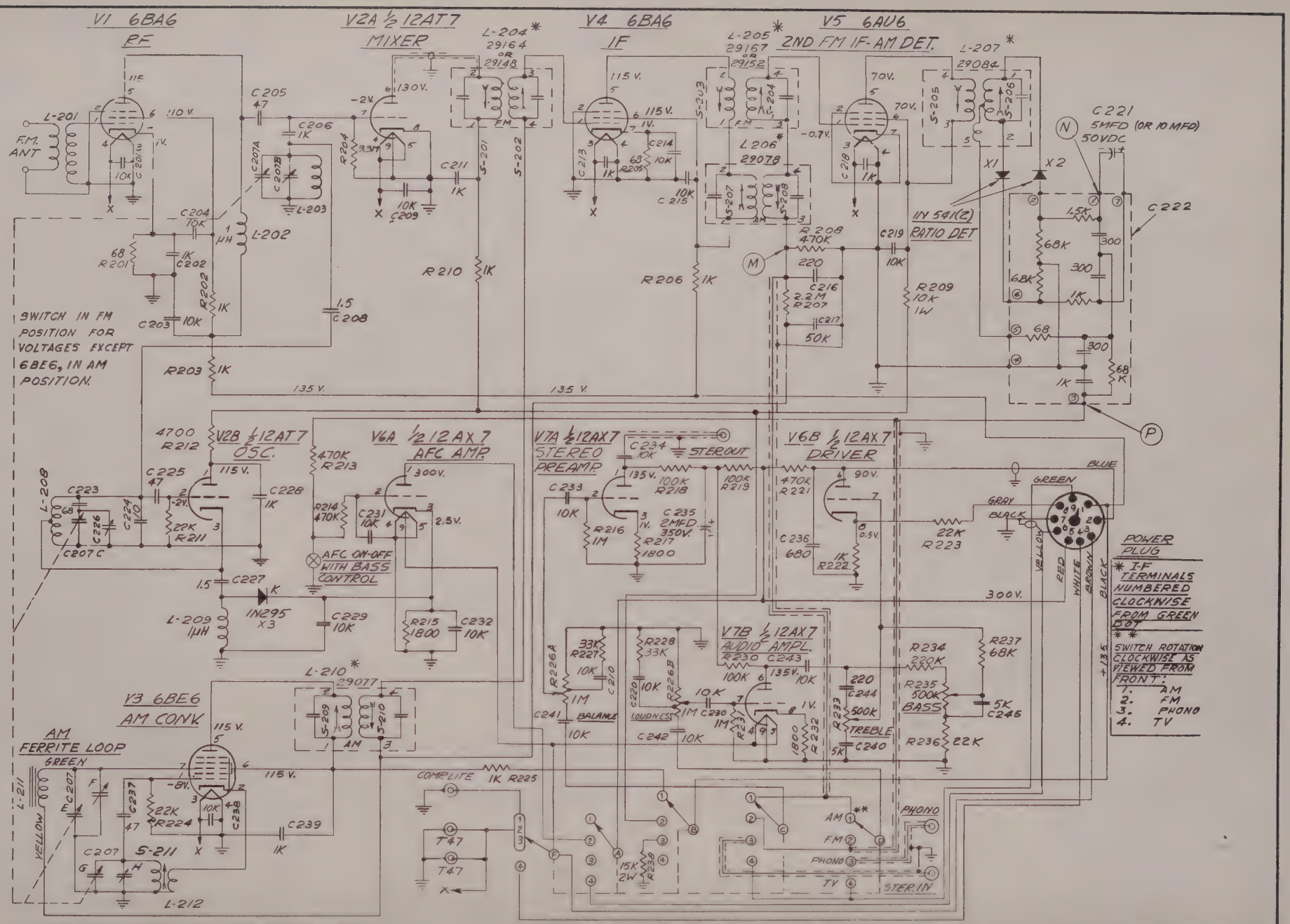
SET 456 FOLDER 3



PACKARD-BELL MODEL 7TU1

Schematic Diagram Courtesy of Packard-Bell Electronics

	DUMMY ANTENNA	SIGNAL GENERATOR CONNECTION	SIGNAL GENERATOR FREQUENCY	RADIO RECEIVER DIAL SETTING	VTVM CONNECTION	ADJUST	NOTES
ALIGNMENT OF I-F, AM SECTION							
1.	.01 mfd in series with gen. output	Pin 7 of V-3 (grid 3, 6BE6)	455 kc, modulated with 400 cps	Low frequency end point	Negative to point "M", positive to ground	S-207, S-208, S-209, & S-210 for MAXIMUM	Reduce signal generator output to lowest usable level
ALIGNMENT OF R-F, AM SECTION							
2.	None	Loose couple to loop	1620 kc, modulated with 400 cps	High frequency end point	Ditto	C-207H for MAXIMUM	None
3.	None	Ditto	530 kc, modulated with 400 cps	Low frequency end point	Ditto	S-211 for MAXIMUM	Repeat steps 2 & 3 till no increase in maximums
3A.	None	Ditto	1500 kc, modulated with 400 cps	Tune in signal	Ditto	C-207F for MAXIMUM	None
ALIGNMENT OF I-F, FM SECTION (AFC SWITCH PULLED OUT TO OFF POSITION)							
4.	.01 mfd. in series with gen. output	Pin 7 of V-2A (grid, FM mixer, ½12AT7)	10.7 mc, unmodulated	Low frequency end point	Ditto	S-201, S-202, S-203, & S-204 for MAXIMUM	Reduce signal generator output to less than one volt at pt. "M"
5.	Ditto	Ditto	Ditto	Ditto	Negative to point "N", positive to ground	S-205 for MAXIMUM	None
6.	Ditto	Ditto	Ditto	Ditto	Negative to point "P", positive to ground	S-206 for ZERO	A plus or minus reading will be obtained on each side of setting.
ALIGNMENT OF R-F, FM SECTION (AFC SWITCH PULLED OUT TO OFF POSITION)							
7.	150 ohms in each lead	FM antenna terminal	106 mc, unmodulated	106 mc	Negative to point "N", positive to ground	C-226 for MAXIMUM	None
8.	Ditto	Ditto	Ditto	Ditto	Ditto	C-207B for MAXIMUM	None
9.	Ditto	Ditto	92 mc, unmodulated	92 mc	Ditto	Compress or expand L-208 for MAXIMUM	None
10.	Ditto	Ditto	Ditto	Ditto	Ditto	Compress or expand L-203 for MAXIMUM	None
11.	REPEAT STEPS 7 THRU 10 UNTIL NO FURTHER INCREASE IN VTVM READING OCCURS.						

ALIGNMENT CHART, TUNER 7TU1

PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

AMPEX
MODEL 402

AMPEX
MODEL 402

AMPEX
MODEL 402

TRADE NAME	Ampex Model 402
MANUFACTURER	Ampex Audio, Inc., 1020 Kifer Road, Sunnyvale, California
TYPE SET	AC Operated 4 Tube Stereo Preamplifier
POWER SUPPLY	110-120 Volts AC, 60 Cycles RATING 20 Watts, .23 Amp. @ 117 Volts AC

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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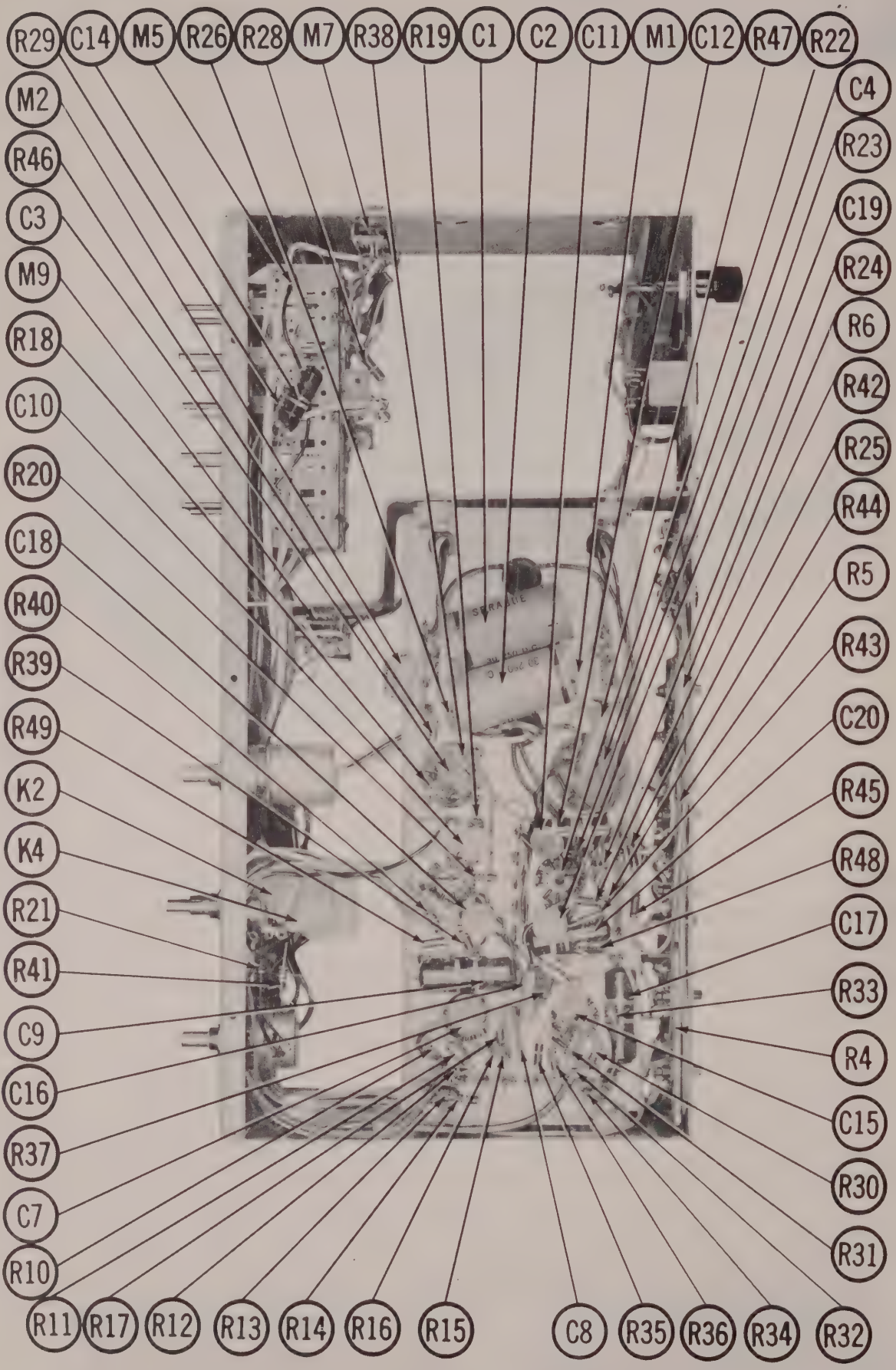


CHASSIS BOTTOM VIEW – RESISTOR, CAPACITOR & MISC. IDENT.

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Right Channel Preamp.	12AX7	
V2	Right Channel AF Amp. - Left Channel AF Amp.	12AX7	
V3	Right Channel Cath. Foll. - Left Channel Cath. Foll.	ECC82/ 12AU7	
V4	Left Channel Preamp.	12AX7	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	AMPEX PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1	30	250	55-0034	PRS250V30	BR3025	TC77	TD-30-250	TVA-1510	
C2	30	250	55-0034						
C3A	■40	350	55-0033		D0032	FP396.2	TMT-150	TVLS-4613*	
B	▲40	350			BR1045	TC78	TD-10-450		
C	▲10	300							
D	10	300							
C4	2000	15	55-0026		A0070	WP041	TMS-5	TVL-1168	

* Not normally in distributor's stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	AMPEX PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C5	.1	200	10%	54-0033	V84C2P1		PM2P1	GTM-201	2TM-P1	
C6	.01	200	10%	54-0035	V84C2S1		PM2S1	GTM-211	2TM-S1	
C7	4700			54-0006	BPD-0047	DD-472	BYA10D47M	B-247	5HK-D47	
C8	1000		5%		1469-001		1R5D1	MCE251	MS-21	①
C9	.1	400		54-0010	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C10	20000			54-0011	BPD-02	DD-203	BYB6S2	B-120	5HK-S2	
C11	20000			54-0011	BPD-02	DD-203	BYB6S2	B-120	5HK-S2	
C12	.047	400		54-0003	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C13	.1	200	10%	54-0033	V84C2P1		PM2P1	GTM-201	2TM-P1	
C14	.01	200	10%	54-0035	V84C2S1		PM2S1	GTM-211	2TM-S1	
C15	4700			54-0006	BPD-0047	DD-472	BYA10D47M	B-247	5HK-D47	
C16	1000		5%		1469-001		1R5D1	MCE251	MS-21	①
C17	.1	400		54-0010	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C18	20000			54-0011	BPD-02	DD-103	BYB6S2	B-120	5HK-S2	
C19	20000			54-0011	BPD-02	DD-103	BYB6S2	B-120	5HK-S2	
C20	.047	400		54-0003	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	

① Some versions may use 750mmf 5% in this application (Part #540034).

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	AMPEX PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500K *		52-0013				UE1733	Loudness, Right Ch.
B	500K *							Loudness, Left Ch.
R2A	500K ▲		52-0014	BT-65				Treble, Right Chan.
B	500K ▲			STR-65				Treble, Left Chan.
R3A	1meg		52-0015-1B	B-69	AD47-1meg-S	Q11-137	† UE4022-S	Bass, Right Chan. Note 1
B	1meg			SR-69	Not Req.	M11-137		Bass, Left Chan. Note 1
C	Shaft			Not Req.	FS-3	Not Req.		
D	Switch			KR-2	SWE-20	76-2		Power Off-On
R4A	500K		52-0018					AM-Left Chan.
B	500K							AM-Right Chan.
R5A	500K		52-0018					FM-Left Chan.
B	500K							FM-Right Chan.
R6A	500K		52-0018					Ext-Left Chan.
B	500K							Ext-Right Chan.

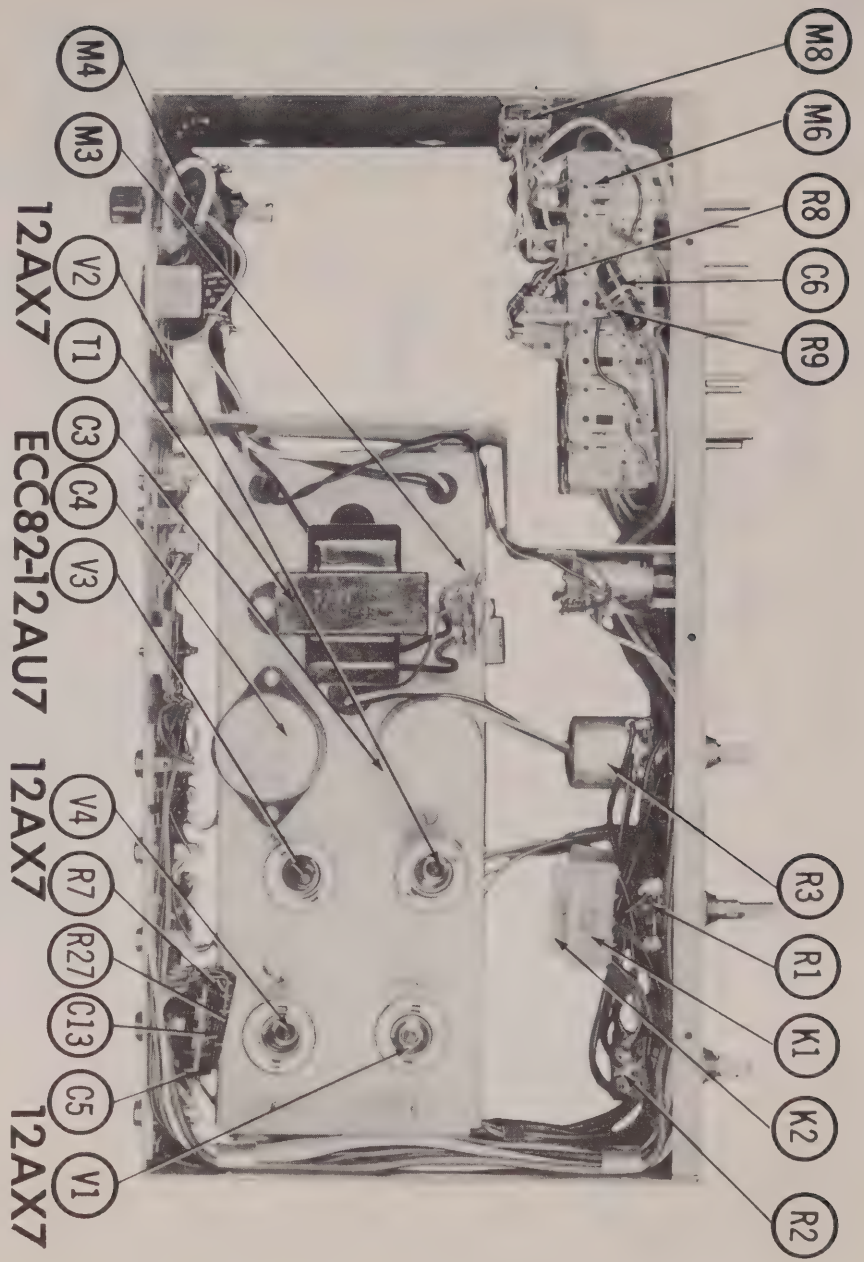
† STA-LOC" equivalent: FA16L, RU16L, CS3500, US42

Note 1. Some versions may use 500K dual bass (Part #52-0015-1).

* Taps ⓐ 180K, 330K

▲ Taps ⓐ 250K

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	AMPEX PART No.	NOTES
R7	4700Ω		51-0001	
R8	820Ω		51-0085	
R9	2700Ω		51-0084	
R10	330K		51-0029	
R11	330K		51-0029	
R12	220K			
R13	1000Ω 5%		51-0026	
R14	120K 5%		51-0082	Note 1
R15	10meg		51-0025	
R16	220K			
R17	10meg 5%		51-0083	
R18	39K		51-0019	
R19	100K		51-0037	
R20	680Ω		51-0074	
R21	47K		51-0049	
R22	1meg		51-0012	
R23	5600Ω		51-0059	
R24	10K		51-0058	
R25	1meg		51-0012	
R26	4700Ω		51-0001	
R27	4700Ω		51-0001	
R28	820Ω		51-0085	
R29	2700Ω		51-0084	
R30	330K		51-0029	
R31	330K		51-0029	
R32	220K			
R33	120K 5%		51-0082	Note 1
R34	1000Ω 5%		51-0026	
R35	10meg		51-0025	
R36	220K			
R37	10meg 5%		51-0083	
R38	39K		51-0019	
R39	100K		51-0037	
R40	680Ω		51-0074	
R41	47K		51-0049	
R42	1meg		51-0012	
R43	5600Ω		51-0059	
R44	10K		51-0058	
R45	1meg		51-0012	
R46	4700Ω		51-0001	
R47	1.2Ω	1	51-0010	
R48	1meg		51-0012	Note 2
R49	1meg		51-0012	Note 2

Note 1. Some versions may use 150K in this application (Part #51-0082).
Note 2. Not used in some versions.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	AMPEX PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ .23A	145V @ .040A (AC)	27 VCT @ .450A	58-0010						
	SEC. 3	SEC. 4	SEC. 5							
	6.3 VCT @ .45A									

RECTIFIERS

ITEM No.	RATING CURRENT (Measured)	AMPEX PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	SYLVANIA PART No.	NOTES
M1	.012A	57-0007 ①	K1734 ①	D-5414 ①②			① Selenium Type. ② Two Required
M2	.012A	57-0007 ①	K1734 ①	D-5414 ①②			
M3	.605A	57-0006 ①		BIH ①		4N33-1C1-RV ①	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA AMPEX PART No. FUSE	AMPEX PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M4	AGC	1.5A 250V S/B	61-0003	63-0015	31301.5 (3AG 1½A 250V S/B)	342012	AGC 1½	HKP

MISCELLANEOUS

ITEM No.	PART NAME	AMPEX PART No.	NOTES
M5	Switch	62-0017	Pushbutton (Left Chan.)
M6	Switch	62-0017	Pushbutton (Right Chan.)
M7	Switch	62-0032	Left Chan. In-Out (DPDT, Slide Type)
M8	Switch	62-0032	Right Chan. In-Out (DPDT, Slide Type)
M9	Switch		Monitor

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	AMPEX PART No.	REPLACEMENT DATA	
K1	Tone Compensation	100mmf, 4700mmf, 4700mmf, 1000Ω, 100K, 100K, 470K	50-0002	Centralab	PC-190
				Sprague	TCS-16
K2	Loudness Compensation	100mmf, 200mmf, 4500mmf, 4500mmf, 50K, 50K	50-0003	Centralab	PC-324
				Sprague	TC-4
K3	Tone Compensation	100mmf, 4700mmf, 4700mmf, 1000Ω, 100K, 100K, 470K	50-0002	Centralab	PC-190
				Sprague	TCS-16
K4	Loudness Compensation	100mmf, 200mmf, 4500mmf, 4500mmf, 50K, 50K	50-0003	Centralab	PC-324
				Sprague	TC-4

CABINETS & CABINET PARTS

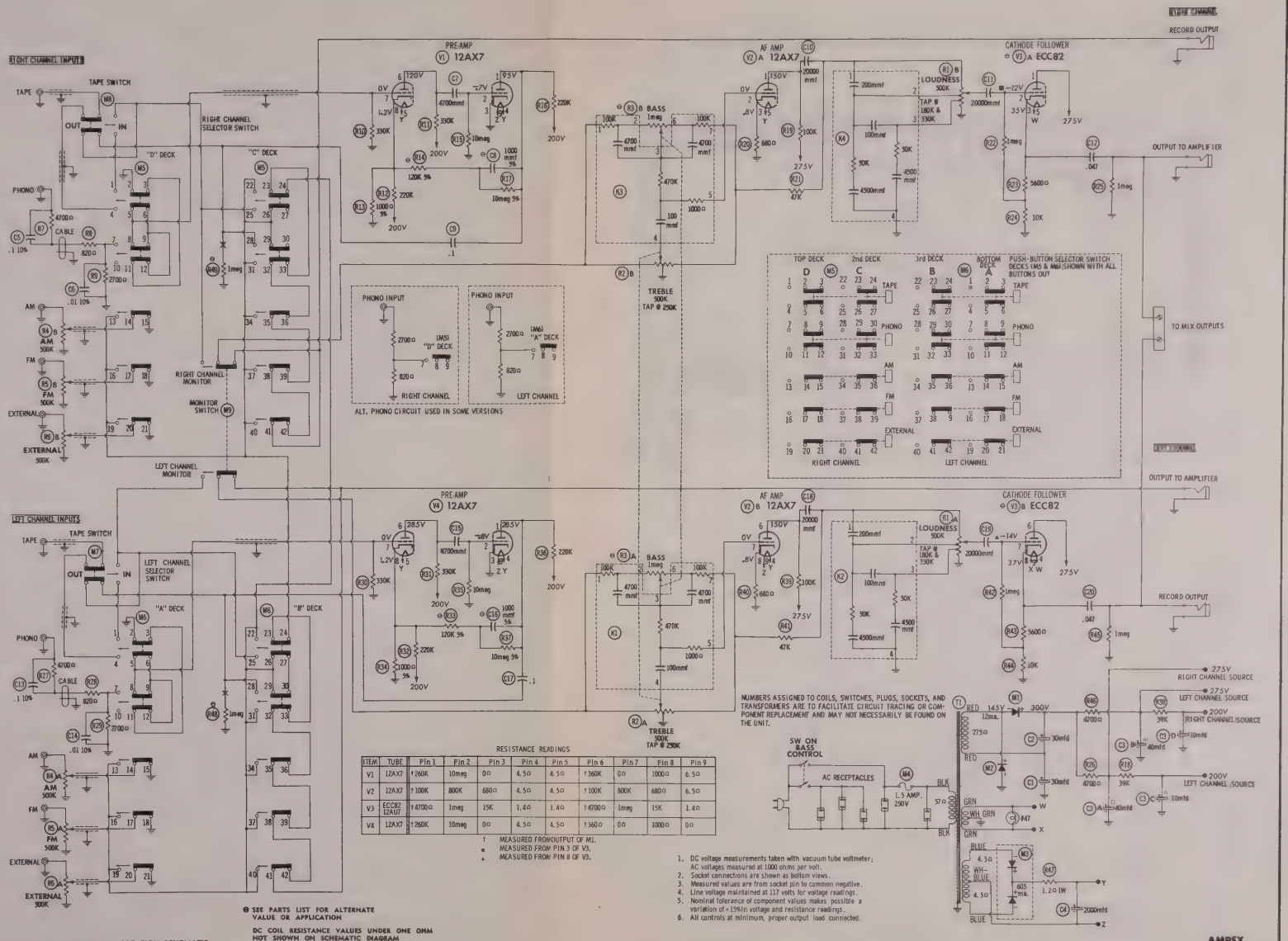
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	10-0019	Loudness Control Top, With Pointer
Knob	10-0021	Loudness Control Bottom
Knob	10-0018-1	Bass, Treble
Pushbutton	10-0017-2	Monitor
Pushbutton	10-0017-1	

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	†260K	10meg	0Ω	4.5Ω	4.5Ω	†360K	0Ω	1000Ω	6.5Ω
V2	12AX7	†100K	800K	680Ω	4.5Ω	4.5Ω	†100K	800K	680Ω	6.5Ω
V3	ECC82 12AU7	†4700Ω	1meg	15K	1.4Ω	1.4Ω	†4700Ω	1meg	15K	1.4Ω
V4	12AX7	†260K	10meg	0Ω	4.5Ω	4.5Ω	†360Ω	0Ω	1000Ω	0Ω

† MEASURED FROM OUTPUT OF M1.
▪ MEASURED FROM PIN 3 OF V3.
▲ MEASURED FROM PIN 8 OF V3.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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AMPEX MODEL 402

PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

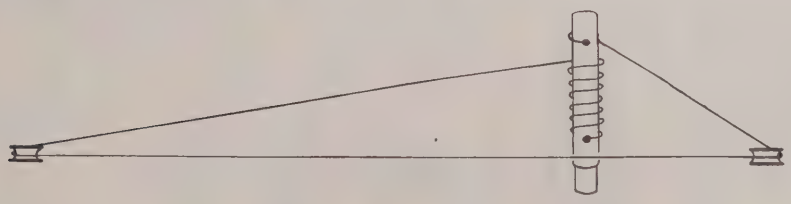
BLONDER-TONGUE MODEL T-88

BLONDER-TONGUE
MODEL T-88

BLONDER-TONGUE
MODEL T-88

TRADE NAME	Blonder-Tongue Model T-88		
MANUFACTURER	Blonder-Tongue Laboratories, Inc., 9 Alling Street, Newark 2, N. J.		
TYPE SET	AC-DC Operated 4 Tube FM-AM Tuner		
POWER SUPPLY	110-120 Volts AC-DC	RATING	24 Watts, .27 Amp. @117 Volts AC (FM)
TUNING RANGE—BROADCAST	535-1620KC	FREQ. MOD.	88-108MC

DIAL CORD STRINGING



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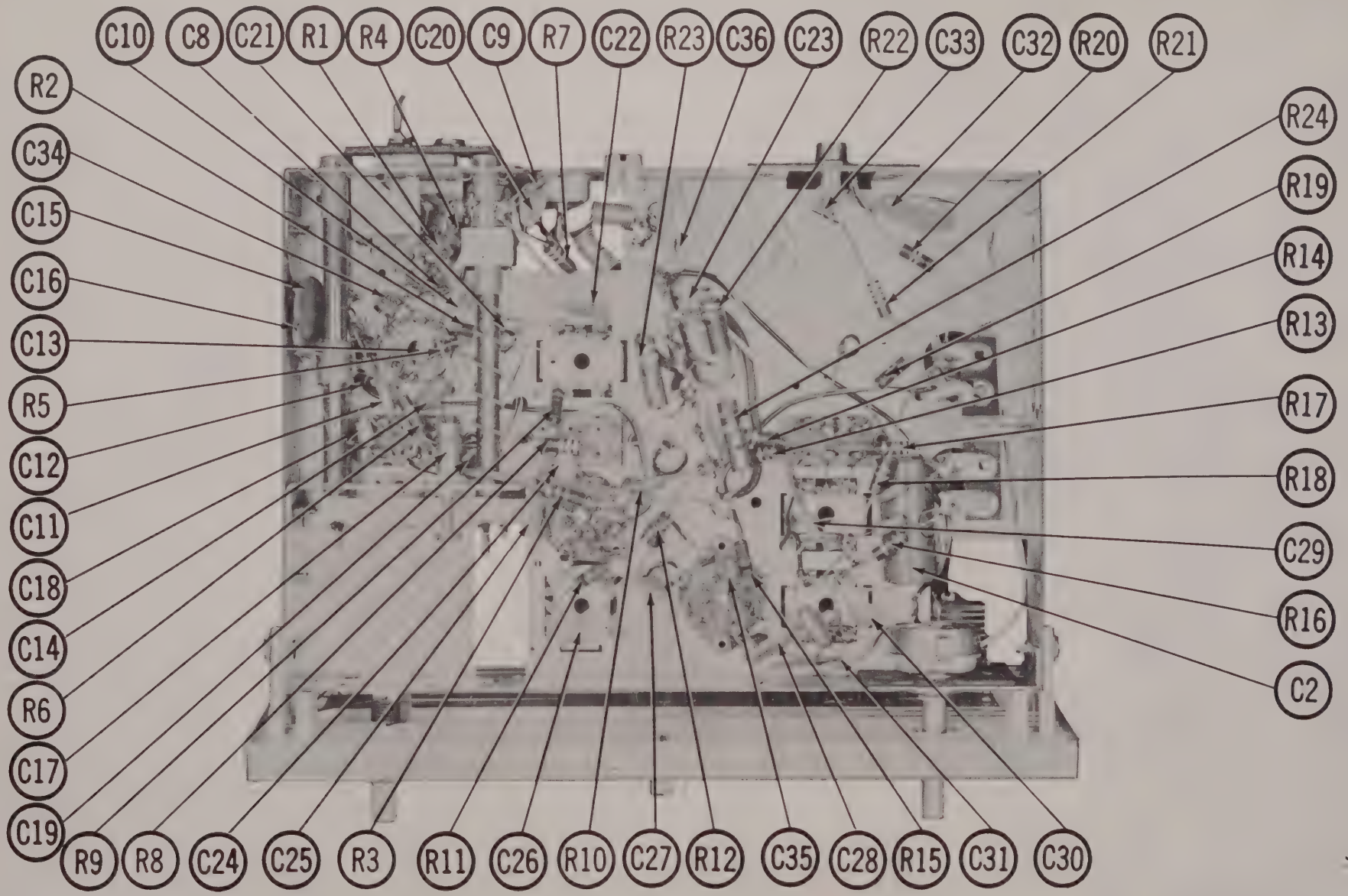
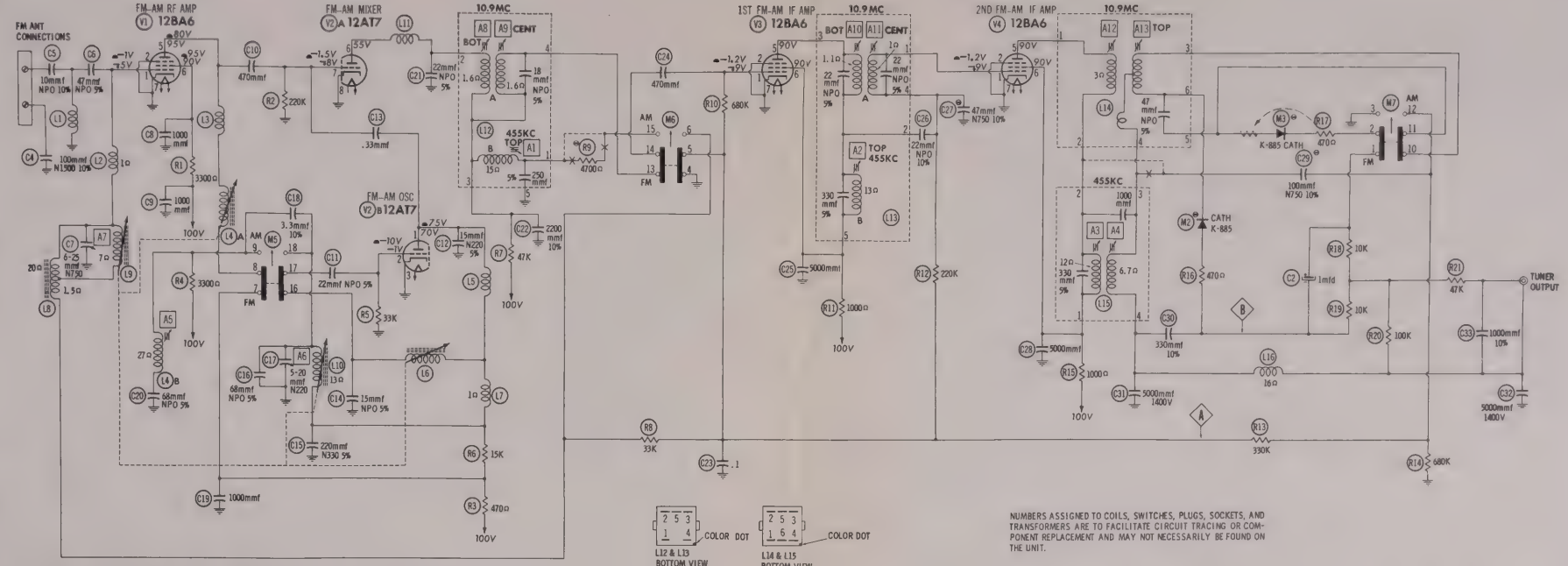
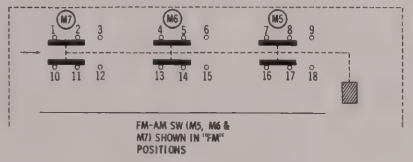
DATE 9—59

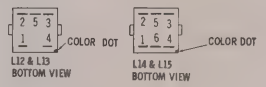
SET 456 FOLDER 5



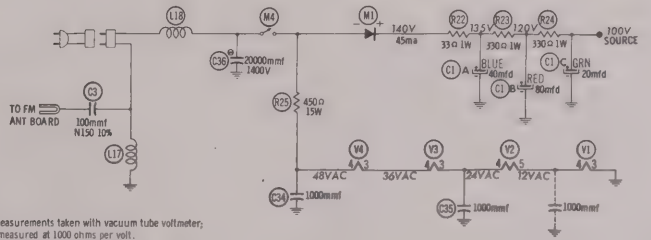
CHASSIS BOTTOM VIEW — CAPACITOR & RESISTOR IDENT.







NUMBERS ASSIGNED TO COILS, SWITCHES, PLUGS, SOCKETS, AND TRANSFORMERS ARE TO FACILITATE CIRCUIT TRACING OR COMPONENT REPLACEMENT AND MAY NOT NECESSARILY BE FOUND ON THE UNIT.



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12BA6	33K ▲ 390K	0Ω	0Ω	12Ω	↑1100Ω ▲ ↑4400Ω	↑4400Ω	0Ω		
V2	12AT7	↑16K	33K	0Ω	24Ω	12Ω	↑48K	220K	0Ω	18Ω
V3	12BA6	680K ▲ 1.1meg	0Ω	24Ω	36Ω	↑1700Ω	↑1700Ω	0Ω		
V4	12BA6	250K ▲ 550K	0Ω	36Ω	48Ω	↑1700Ω	↑1700Ω	0Ω		

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.
↑ MEASURED FROM OUTPUT OF M1.
▲ MEASURED IN "AM" POSITION.

❶ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. No signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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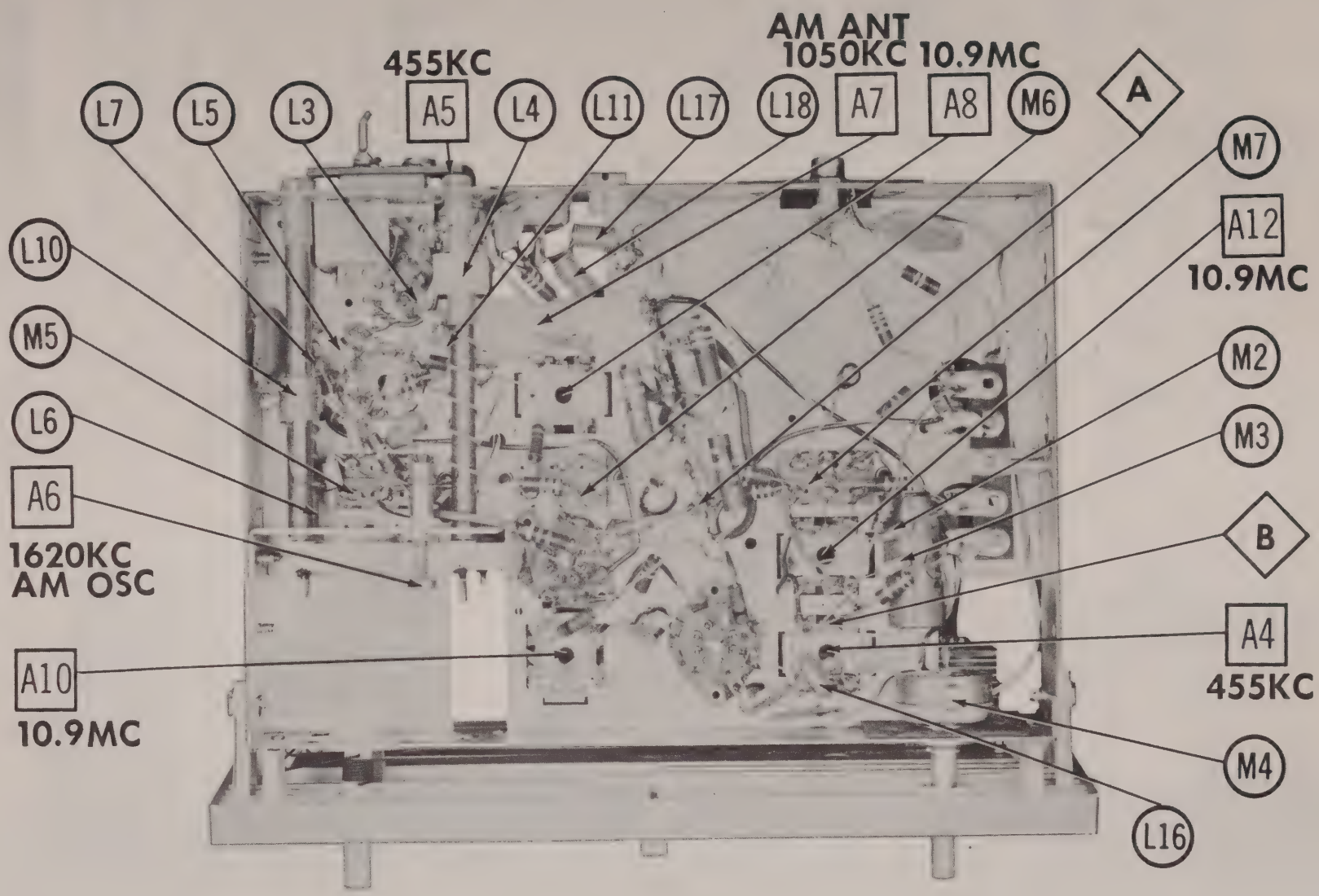
BLONDER-TONGUE MODEL T-88



CHASSIS BOTTOM VIEW – ALIGN., INDUCTOR & MISC. IDENT.

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use only enough generator output to provide a usable indication on VTVM.
Suggested alignment tools: A1 thru A4, A8 thru A13..... GENERAL CEMENT #8606, 8606L, 8282, 9295
WALSCO #2526, 2543, 2544, 2545
A5, A14, A15..... GENERAL CEMENT #5009, 8195, 8274, 8275, 8728, 8987
WALSCO #2531

AM ALIGNMENT

Connect the negative lead of a 4.5 volt bias supply to point Ⓐ. Positive to chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1.	.005mfd	High side to pin 7 (grid) of Converter. Low side to chassis.	455KC (400∿ Mod.)	AM	1600KC	DC probe to output jack. Common to chassis.	A1, A2, A3, A4	Adjust for maximum deflection.
2.	"	"	"	"	Low End stop.	"	A5	Adjust for MINIMUM deflection.
3.		Loop	1620KC	"	Tuning gang fully open	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
4.		"	1050KC	"	1050KC Signal	"	A7	Adjust for maximum deflection. Set dial point to 1050KC.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
5.	.005mfd	High side to pin 7 (grid) of Mixer. Low side to chassis	10.9MC (Unmod.)	FM	108MC	DC probe to point Ⓑ. Common to chassis.	A8, A9, A10, A11, A12	Adjust for maximum deflection.
6.	"	"	"	"	"	DC probe to output jack. Common to chassis.	A13	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.
Use only enough sweep generator output to provide a usable pattern on scope.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
5.	.005mfd	High side to pin 7 (grid) of Mixer. Low side to chassis.	10.9MC (450KC Swp)	FM	108MC	Vert. amp to point Ⓑ. Low side to chassis.	A8, A9, A10, A11, A12	Disconnect Stabilizing Capacitor C2. Adjust for maximum gain and symmetry of response similar to Fig. 1 with markers as shown.
6.	"	"	"	"	"	Vert. amp to output jack. Low side to chassis.	A13	Reconnect C2. Adjust to place marker at the center of crossover lines similar to Fig. 2. SLIGHTLY retouch A12 for maximum amplitude and straightness of crossover lines.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
7.	Direct	Across FM antenna terminals.	98MC (Unmod.)	FM	98MC	DC probe to point Ⓑ. Common to chassis.	L5, L3, L1	Adjust for maximum deflection.

FIG. 1

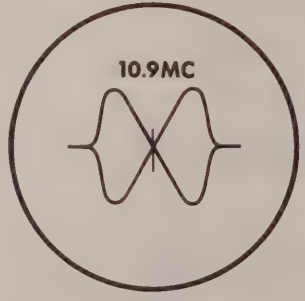
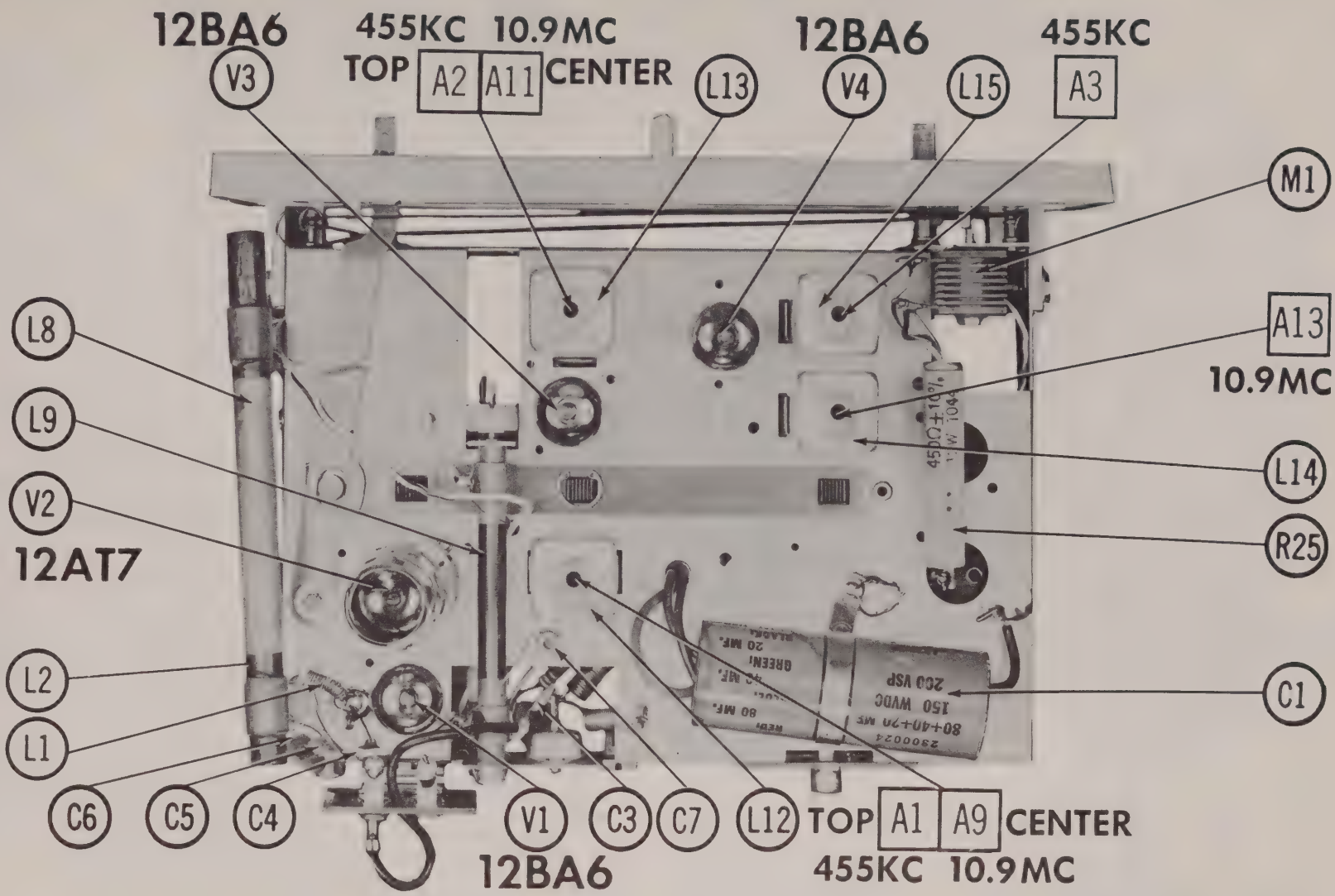


FIG. 2



CHASSIS — TOP VIEW
MODEL T-88
BLONDER-TONGUE

FOLDER 5

PARTS LIST AND DESCRIPTIONS

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	FM-AM RF Amplifier	12BA6	
V2	FM-AM Mixer-FM-AM Oscillator	12AT7	
V3	1st FM-AM IF Amplifier	12BA6	
V4	2nd FM-AM IF Amplifier	12BA6	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA Blonder-Tongue PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	40	150		PRS150V80-40-20	BBRT84215	TCT3117	TDLT-7	TVA-3455	
B	80	150							
C	20	150							
C2	1	50		PRS450V1	BBR1-50	TC31	TD-1-50	TVA-1300	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	REPLACEMENT DATA Blonder-Tongue PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C3	100		N150 10%							
C4	100		N1500 10%			TCL-100				
C5	10		NPO 10%		NPO-DI 10	DTZ-10	C10Q1C	CNO-410	5TCC-Q1S 10%*	
C6	47		NPO 5%			DTZ-47	C10Q47C	CNO-447	5TCC-Q47S 5%*	
C7	6-25		N750							
C8	1000				BPD-001	DD-102	BYA10D1	B-210	5HK-D1	
C9	1000				BPD-001	DD-102	BYA10D1	B-210	5HK-D1	
C10	470				BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C11	22		NPO 5%			TCZ-22	C10Q22C	CNO-422	5TCC-Q22S 5%*	
C12	15		N220 5%							
C13	.33									
C14	15		NPO 5%		NPO-DI 15	DTZ-15	C10Q15C	CNO-415	5TCC-Q15S 5%*	
C15	220		N330 5%							
C16	68		NPO 5%			DTZ-68	C10Q68C	CNO-468	5TCC-Q68S 5%*	
C17	5-20		N220							
C18	3.3		10%		NPO-SI 3.3	TCZ-3R3	C10V33C	ZT-5533	5TCCB-V33S 10%*	
C19	1000				BPD-001	DD-102	BYA10D1	B-210	5HK-D1	
C20	68		NPO 5%			DTZ-68	C10Q68C	CNO-468	5TCC-Q68S 5% *	
C21	22		NPO 5%			DTZ-22	C10Q22C	CNO-422	5TCC-Q22S 5% *	
C22	2200		10%		DI-2200			JL-222	5GA-D22S 10%*	
C23	.1	200			P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C24	470				BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C25	5000				BPD-005	DD-502	BYA10D5	B-250	5HK-D47	
C26	22		NPO 10%		NPO-DI 22	DTZ-22	C10Q22C	CNO-422	5TCC-Q22S 10%*	
C27	47		N750 10%		N750-DI 47	DTN-47	C10Q47U	CN7-447	5TCU-Q47S 10%*	①
C28	5000				BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C29	100		N750 10%		N750-DI 100	DTN-100	C10T1U	CN7-310	5TCU-T1S 10%*	②
C30	330		10%		DI-330	D6-331		JL-333	5GA-T33S 10%*	
C31	5000	1400			DAC-9	DD16-502	HVE16D5	2HV-247	20HK-D5	
C32	5000	1400			DAC-9	DD16-502	HVE16D5	2HV-247	20HK-D5	
C33	1000		10%		DI-1000			JL-210	5GA-D1S 10%*	
C34	1000				BPD-001	DD-102	BYA10D1	B-210	5HK-D1	
C35	1000				BPD-001	DD-102	BYA10D1	B-120	5HK-D1	
C36	20000	1400								③

* Not normally in distributor's stock. Available thru distributor on order to manufacturer.
Note 1. Some versions may use 100mmf N1500 10% in this application.
Note 2. Some versions may use 1000mmf in this application.
Note 3. Some versions may use 5000mmf in this application.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	Blonder-Tongue PART No.	NOTES
R1	3300Ω			
R2	220K			
R3	470Ω			
R4	3300Ω			
R5	33K			
R6	15K			
R7	47K			
R8	33K			
R9	4700Ω			Note 1
R10	680K			
R11	1000Ω			
R12	220K			
R13	330K			
R14	680K			
R15	1000Ω			
R16	470Ω			
R17	470Ω			
R18	10K			
R19	10K			
R20	100K			
R21	47K			
R22	33Ω	1		
R23	330Ω	1		
R24	330Ω	1		
R25	450Ω	15		

Note 1. Not used in some versions.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA Blonder - Tongue PART No.	Gramer PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	FM Ant. Coil	3340018	19-1000	19-1000	BC-561	4602		1uh
L2	RF Choke	3330038	19-1003	19-1003	BC-564	4608		3.6uh
L3	RF Choke	3340005						
L4A	FM RF Tuning Coil	3500001						
B	AM RF Coil							
L5	RF Choke	3340007						
L6	FM Osc. Tuning Coil	3330035						
L7	RF Choke	3330038	19-1003	19-1003	BC-564	4608		
L8	Loopstick	3320004						
L9	AM Ant. Tuning Coil	3330034						
L10	AM Osc. Tuning Coil	3330036						
L11	RF Choke	3340009						
L12A	1st FM IF	3220012						
B	1st AM IF							
L13A	2nd FM IF	3220013						
B	2nd AM IF							
L14	Ratio Detector	3220015						
L15	3rd AM IF	3220016						
L16	RF Choke	3330037	19-3275	19-3275	TV-203	6138	VP-6	470uh
L17	Line Choke	3340068	19-1001	19-1001	BC-562	4604		1.4uh
L18	Line Choke	3340068	19-1001	19-1001	BC-562	4604		1.4uh

RECTIFIERS

ITEM No.	RATING CURRENT (Measured)	REPLACEMENT DATA Blonder-Tongue PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	SYLVANIA PART No.	NOTES
M1	.046A		1234AH①	T065①	75 ①		① Selenium Type

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA Blonder-Tongue PART No.	CBS PART No.	SYLVANIA PART No.	NOTES
M2	K-885*		1N60	1N295	Detector (Pigtail)
M3	K-885*		1N60	1N295	Detector (Pigtail)

* Some versions may use 1N295 in this application.

MISCELLANEOUS

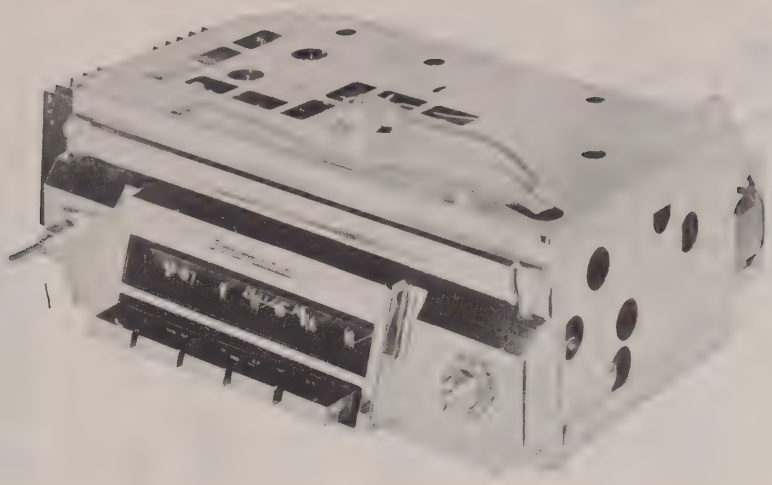
ITEM No.	PART NAME	Blonder-Tongue PART No.	NOTES
M4	Switch	5310022	Off-On
M5	Switch	5310016	FM-AM (DPDT, Slide Type)
M6	Switch	5310016	FM-AM (DPDT, Slide Type)
M7	Switch	5310016	FM-AM (DPDT, Slide Type)

PHOTOFACT* Folder with CIRCUITRACE*

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

BUICK
MODEL 981968

BUICK
MODEL 981968



TRADE NAME	Buick Model 981968 (For 1959 Buick Automobiles)
MANUFACTURER	Delco Radio Div., G. M. Corp., Kokomo, Indiana
TYPE SET	Battery Operated 4 Tube Custom Built Automobile AM Receiver With Transistorized Output
POWER SUPPLY	12 Volt Storage Battery
RATING	2 Amp. @ 12.6 Volts DC
TUNING RANGE—BROADCAST	535 — 1615KC

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.

Suggested Alignment Tools:

A1, A2, A3, and A4..... GENERAL CEMENT #8282, 8606, 8606L, 9091
WALSCO #2526, 2541, 2543, 2544

A5, A9 and A10..... GENERAL CEMENT #8607, 9291
WALSCO #2520, 2522, 2523, 2524, 2537

A6, A7 and A8..... GENERAL CEMENT #5000, 5003, 5014, 5015, 5016, 8276, 8290
WALSCO #2512, 2515, 2522, 2523, 2525, 2537

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1mfd	High side to pin 7 (grid) of Converter. Low side to chassis.	262KC (400~ Mod.)	High end stop	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
	Check setting of oscillator coil core (A5). Rear of core should be 1 5/8" from mounting end of coil form.						
2.	82mmf	High side to antenna connector. Low side to chassis.	1615KC	High end stop	Across voice coil	A6, A7, A8	Adjust for maximum output.
3.	"	"	600KC	600KC Signal	"	A9, A10	"
4.	"	"	1615KC	1615KC Signal	"	A7, A8	"
5.	"	"	900KC	900KC Signal	"		Adjust pointer adjustment until pointer coincides with 900KC on dial.
6.	With radio installed in car and antenna fully extended, tune in a weak station near 1000KC and adjust A8 for maximum output.						

PUSHBUTTON ADJUSTMENT

1. Pull pushbutton out.
2. Tune manually to desired station.
3. Press pushbutton in firmly.
4. Repeat for remaining pushbuttons.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of JD277

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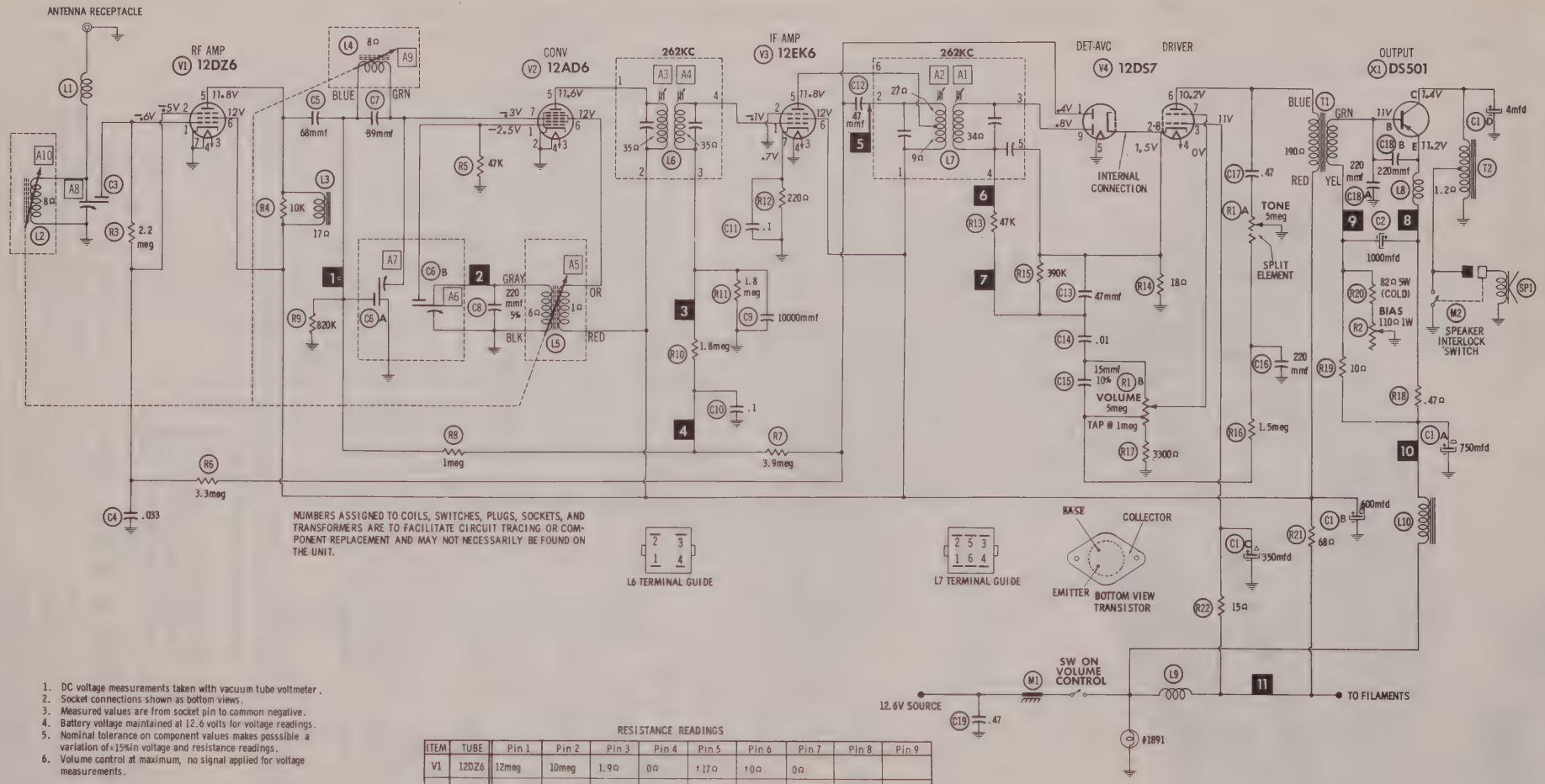

NUMBERS ASSIGNED TO COILS, SWITCHES, PLUGS, SOCKETS, AND TRANSFORMERS ARE TO FACILITATE CIRCUIT TRACING OR COMPONENT REPLACEMENT AND MAY NOT NECESSARILY BE FOUND ON THE UNIT.

1. DC voltage measurements taken with vacuum tube voltmeter.
2. Socket connections shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Battery voltage maintained at 12.6 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12DZ6	12meg	10meg	1.9Ω	0Ω	†17Ω	†0Ω	0Ω		
V2	12AD6	47K	0Ω	1.9Ω	0Ω	†35Ω	†1Ω	820K		
V3	12EK6	1.8meg	0Ω	1.9Ω	0Ω	†9Ω	†0Ω	220Ω		
V4	12DS7	5.7meg	18Ω	†85Ω	1.9Ω	0Ω	†190Ω	3300Ω	18Ω	440K

TRANSISTOR CIRCUIT RESISTANCE NOT GIVEN BECAUSE OF THE WIDE VARIATION IN INTERNAL TRANSISTOR RESISTANCE.
† MEASURED FROM JUNCTION OF R21 AND C1B

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

BIAS ADJUSTMENT (R2)

Adjust R2 for output transistor collector voltage of 1.5VDC with 12VDC input to receiver. Speaker must be connected.

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE

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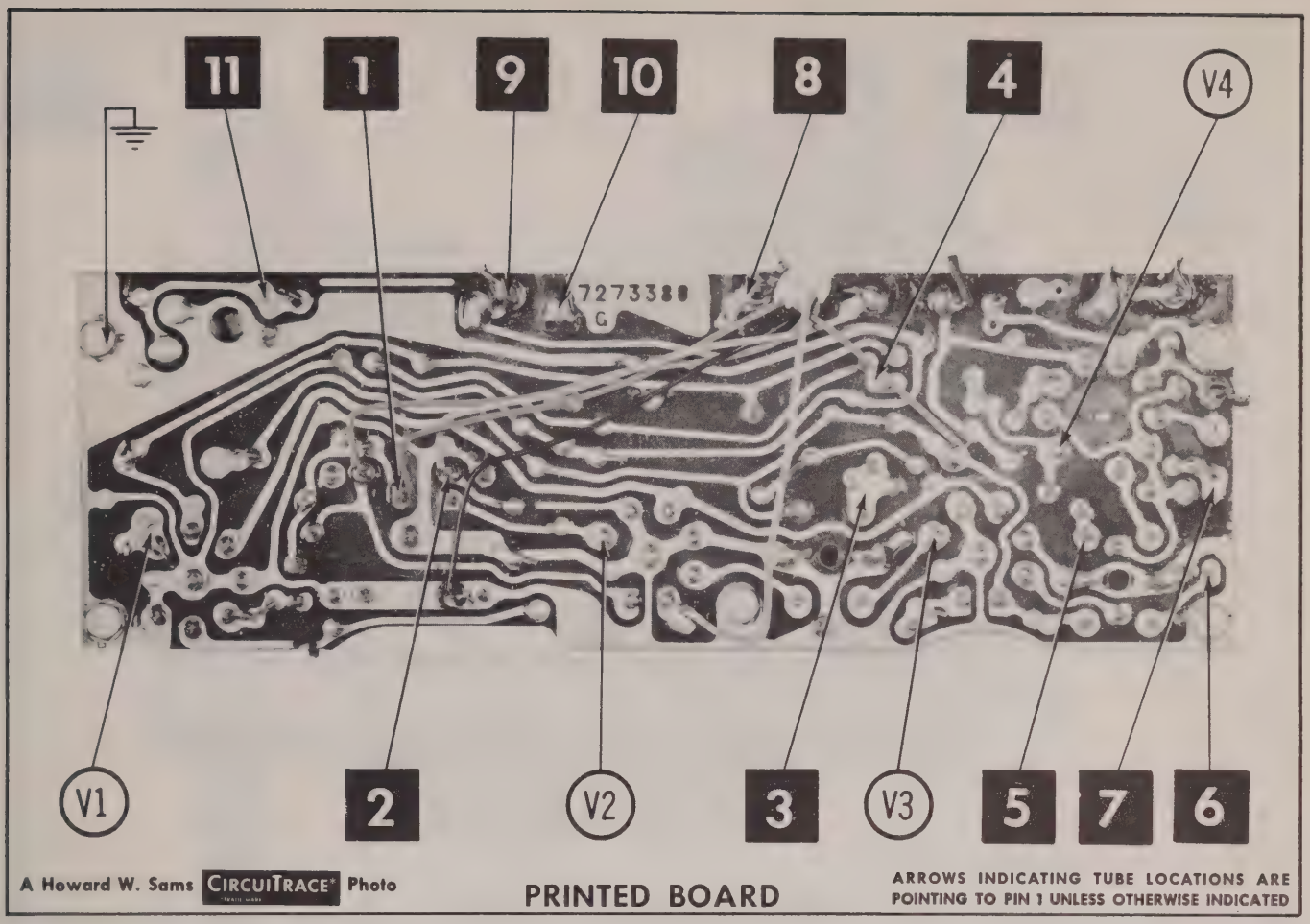
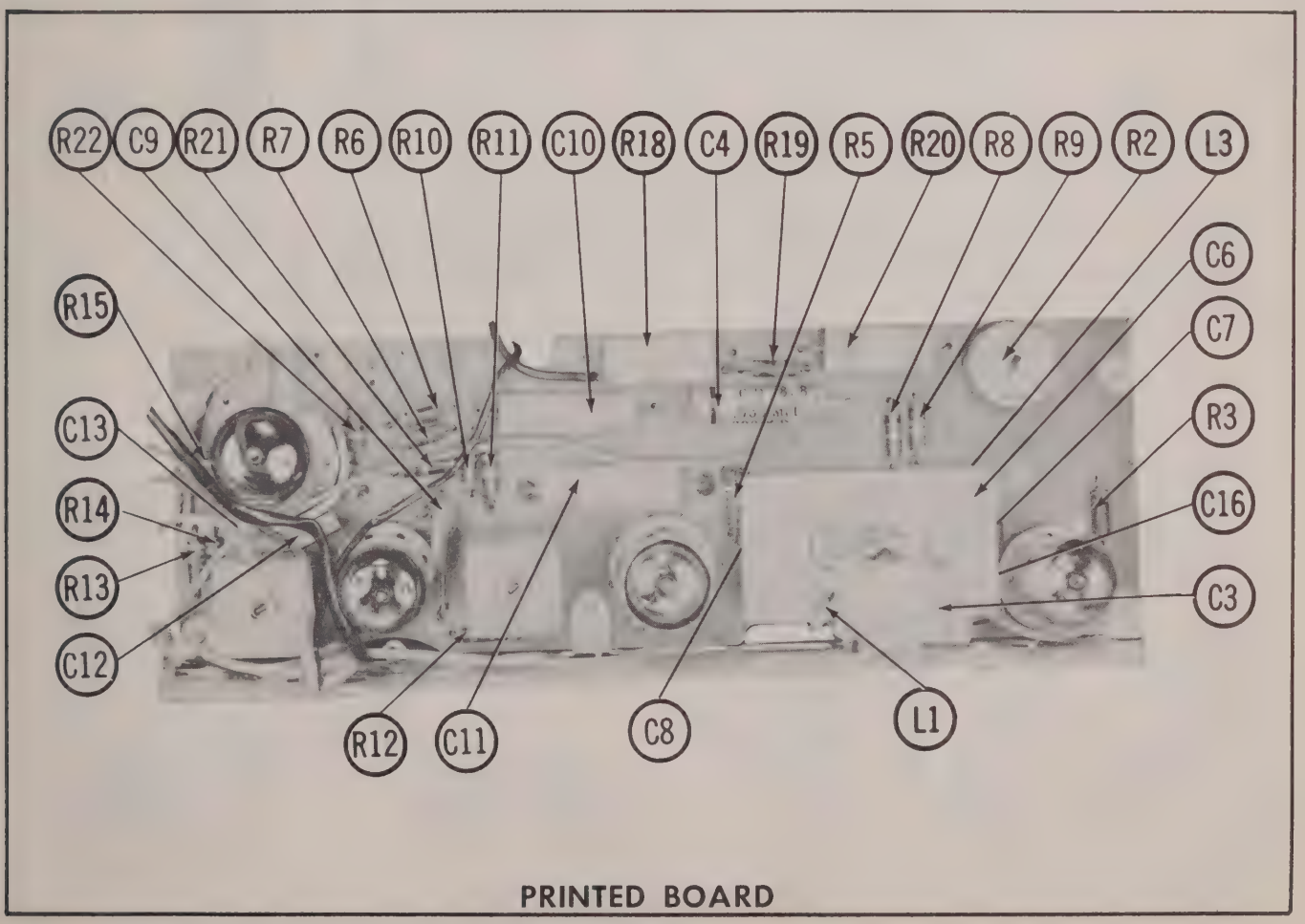
BUICK
MODEL 981968



A Howard W. Sams CIRCUITRACE® Photo

PRINTED BOARD

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



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PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA						NOTES
		DELCO PART No.	Gramer PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	Ant. Coil	7255738	19-1004	19-1004	BC-565	4610		
L2	Ant. Coil	1221138						1.8MH
L3	RF Choke	7269684						
L4	RF Coil	1221138						
L5	Osc. Coil	1221151						
L6	Input IF	1221257	16-6756	16-6756	BC-344	13-PH1		
L7	Output IF	1221253						
L8	RF Choke	1217846						
L9	"A" Lead Choke	1217846						

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA						
	CURRENT (Measured)	DC RES.	INDUCTANCE (0 CURRENT 1000 ~)	DELCO PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L10	.8A	.7Ω	.011 Hy.	7273850				TC-2		

TRANSFORMER (DRIVER)

ITEM No.	TURNS RATIO		REPLACEMENT DATA						NOTES
	PRI.	SEC.	DELCO PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	13	1	7272822						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE	REPLACEMENT DATA							NOTES
	PRI.	DELCO PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	9Ω tap ② 3-4Ω	7273626				TA-50 ①			① Use original channel frame.

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	DELCO PART No.	QUAM PART No.	
SP1	4" x 10"	PM	3-4Ω	7273342	46A15	

MISCELLANEOUS

ITEM No.	PART NAME	DELCO PART No.	NOTES
M1	Spark Plate	1221054	
M2	Switch	7271424	Speaker Interlock
	Printed Board	7273380	

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	1186745	Control
Knob	1186767	Tone
Knob	1186766	Dummy
Pushbutton Ass'y.	1221280	Includes pushbuttons, front bearing plate and slides
Pushbutton	7272805	#1
Pushbutton	7272806	#2
Pushbutton	7272807	#3
Pushbutton	7272808	#4
Pushbutton	7272809	#5
Pointer	7272734	
Dial	7272791	

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors
Shielded Hook-up Wire ..... Use BELDEN No. 8885
Bonding Strap ..... Use BELDEN No. 8661

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier	12DZ6	
V2	Converter	12AD6	
V3	IF Amplifier	12EK6	
V4	Det.-AVC-Driver	12DS7	

TRANSISTORS

ITEM No.	ORIG. TYPE	USE	REPLACEMENT DATA				NOTES
			CBS PART No.	RCA PART No.	RAYTHEON PART No.	SYLVANIA PART No.	
X1	DS501	Output					PNP

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	DELCO PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	
C1A	▲750	16	7273728	AFH4-20-75		WP401.5		TVLS-4204*	
B	■600	16							
C	▲350	16							
D	4	11.5AC							
C2	1000	1	7271557	PRS6V1000	BR1000-6	TC110	TD-1000-6	TVA-1104	

* Not normally in distributor's stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	DELCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3				7266240						
C4	.033	200		7273772	P288N-033	DF-303	STM1S33	GTM-1133	2WF-S33	
C5	68			6369	DI-68	DD-680	L10Q68	CNO-468	5GA-Q68	
C6				7273693						
C7	39			6366	DI-39	DD-390	L10Q39	CNO-439	5GA-Q39	
C8	220		5%	7273511	1469-00022	TCZ-220	5R5T22		MS-322	

CAPACITORS (cont)

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	DELCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C9	10000			7273774	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C10	.1	200		6690	P288N-1	DF-104	CUB2P1	GTM-201	2TM-P1	
C11	.1	200		6690	P288N-1	DF-104	CUB2P1	GTM-201	2TM-P1	
C12	47			6367	1468-000047	DD-470	5W5Q47	CNO-447	1FM-447	
C13	47			6367	1468-000047	DD-470	5W5Q47	CNO-447	1FM-447	
C14	.01	400		6633	P488N-01	DD-103	CUB4S1	GTM-411	4TM-S1	
C15	15		10%	6361	ADM-15-150	DD-150	5W5Q15	CNO-415	MS-415	
C16	220			6375	BPD-00022	DD-221	L10T22	B-322	5GA-T22	
C17	.47	50		7269780	P288N-47		CUB2P47	GTM-1047	2TM-P47	
C18A	220			6375	BPD-00022	DD-221	L10T22	B-322	5GA-T22	
B	220				BPD-00022	DD-221	L10T22	B-322	5GA-T22	
C19	.47	100		6612	P288N-47		CUB2P47	GTM-1047	2TM-P47	

CONTROLS

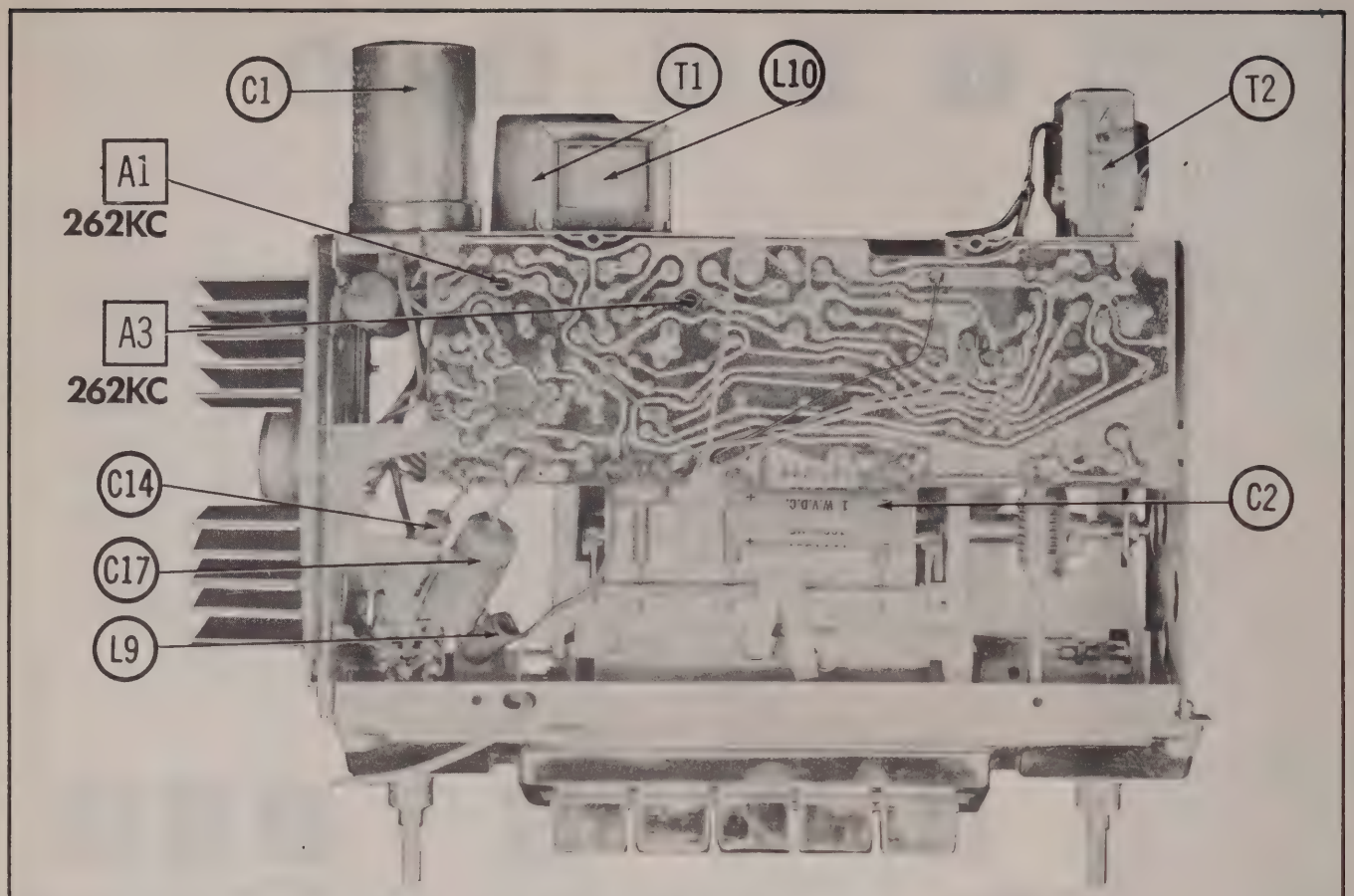
ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	DELCO PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	5meg *		7273993				† UE4004-S	Tone
B	5meg							Volume, Tap ⓐ 1meg
C	Switch							Off-On
R2	110Ω	1(WW)	7273776				PFL-100	Bias

* Split element. Open at 2½meg. † "STA-LOC" Equivalent: FJ56X, RU56T16, OS1437, IS2062, US41.

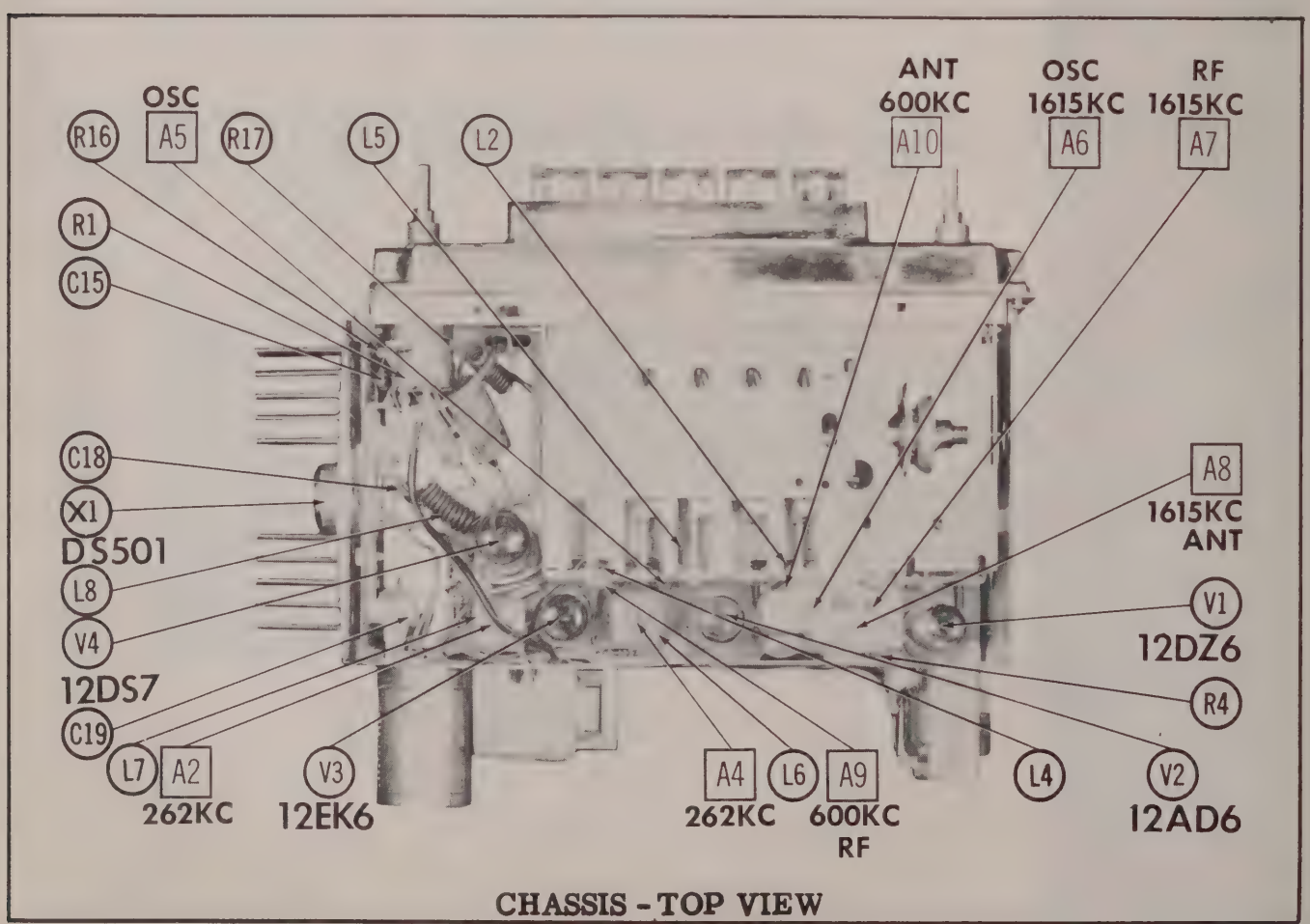
RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		DELCO PART No.	NOTES
	OHMS	WATT		
R3	2.2meg		1239	
R4	10K		1137	
R5	47K		1219	
R6	3.3meg		1241	
R7	3.9meg		1242	
R8	1meg		1235	
R9	820K		1234	
R10	1.8meg		1238	
R11	1.8meg		1238	
R12	220Ω		1117	
R13	47K		1219	
R14	18Ω		1104	
R15	390K		1230	
R16	1.5meg		1237	
R17	3300Ω		1131	
R18	.47Ω		7270608	Fuse Type
R19	10Ω		1101	
R20	82Ω Cold	5	7273786	
R21	68Ω		1111	
R22	15Ω		1103	



CHASSIS - BOTTOM VIEW



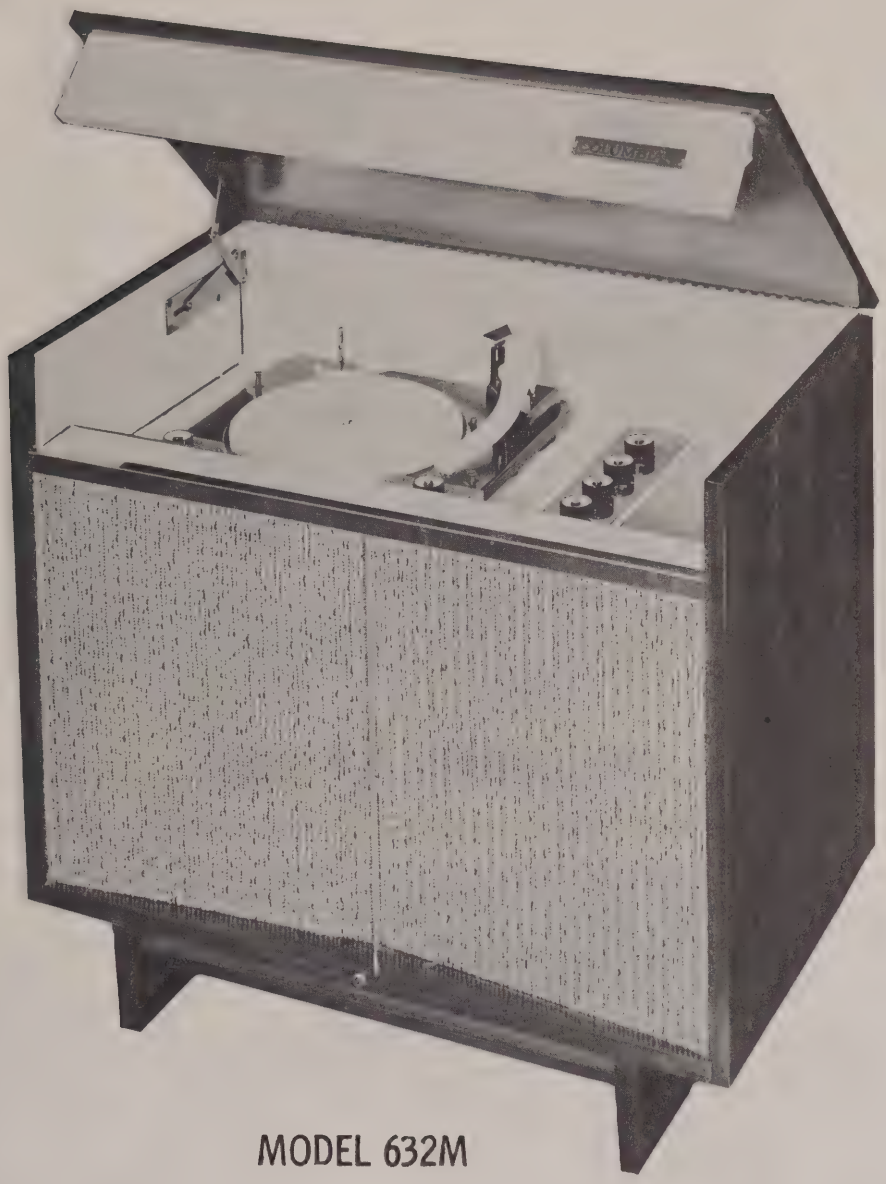
CHASSIS - TOP VIEW

PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

COLUMBIA MODELS 632M, 637

COLUMBIA MODELS
632M, 637



MODEL 632M

COLUMBIA MODELS
632M, 637

TRADE NAME	Columbia Models 632M, 637
MANUFACTURER	CBS-Hytron, 100 Endicott St., Danvers, Mass.
TYPE SET	AC Operated 5 Tube Stereo Amplifier With 4 Speed Automatic Record Changer
POWER SUPPLY	110-120 Volts AC, 60 Cycles RATING 56 Watts, .575 Amp. @ 117 Volts AC

FOR SERVICE INFORMATION ON RECORD CHANGER - SEE SIMILAR V-M 1200A - PHOTOFACT SET 353 FOLDER 16 OR RECORD CHANGER MANUAL RC-10.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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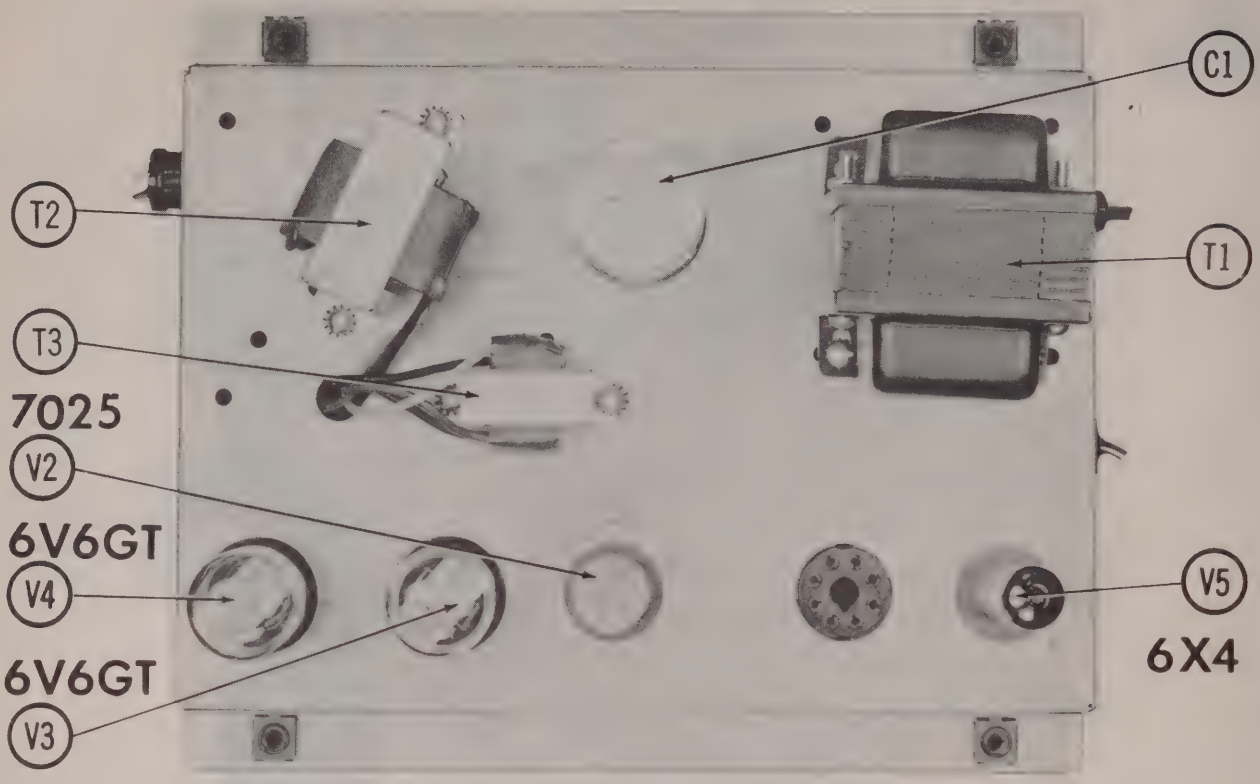
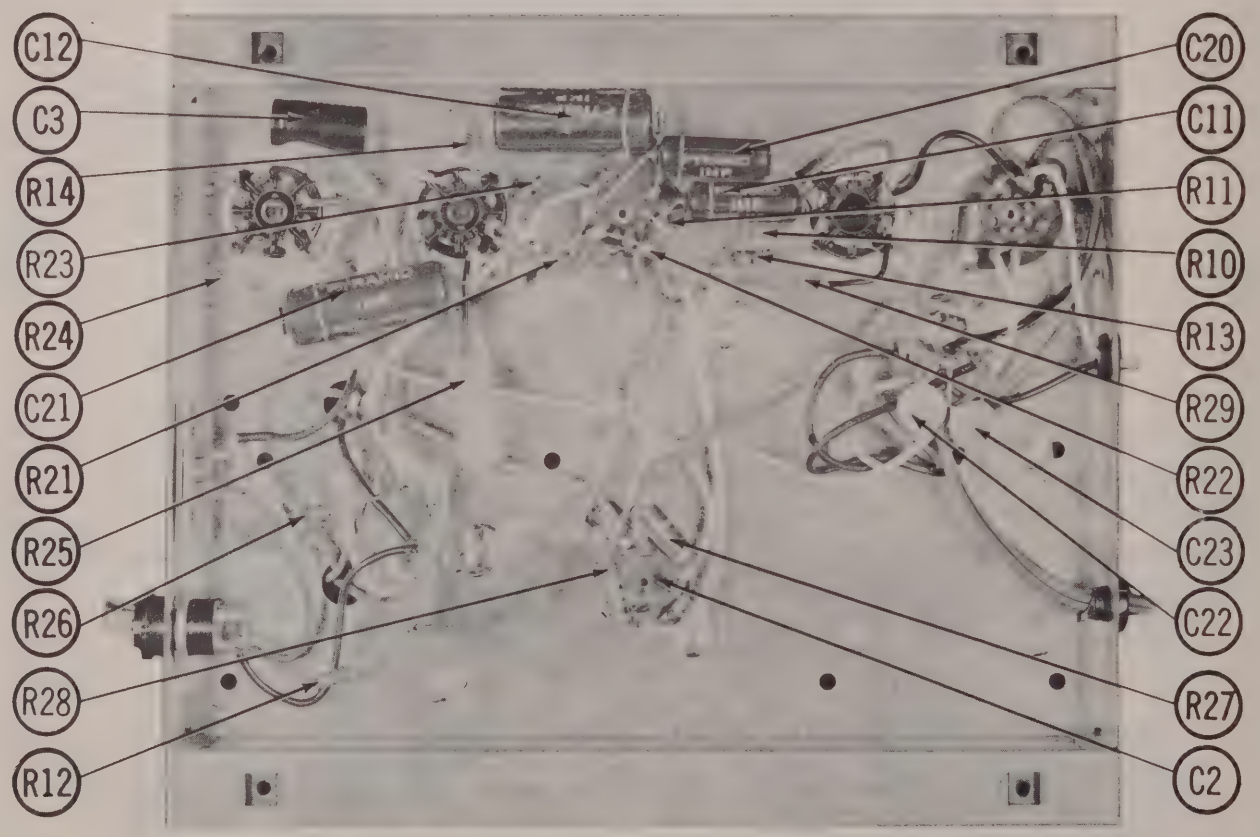
JT192

DATE 9-59 SET 456 FOLDER 7

SET 456 FOLDER 7



AMP CHASSIS - TOP VIEW



AMP CHASSIS - BOTTOM VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Channel AF Amp. - Channel B AF Amp.	ECC83/ 12AX7	
V2	Channel A AF Amp. - Channel B AF Amp.	7025	12AX7 *
V3	Channel A Output	6V6GT	
V4	Channel B Output	6V6GT	
V5	Rectifier	6X4	

* Alternate.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	COLUMBIA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	▲40	450	11B725	AFH4-18-30	D0174	FP447	TMQ-123	TVL-4773	
B	20	450							
C	▲20	450							
D	■20	450							
C2	25	50	11B731	SRE50V25	BBR25-50	TC36	TD-25-50	TVA-1306	
C3	25	50	11B731	SRE50V25	BBR25-50	TC36	TD-25-50	TVA-1306	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	COLUMBIA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	2000				BPD-002	DD-202	BYA10D2	B-220	5HK-D2	
C5	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C6	5000				BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C7	470				BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C8	4000				BPD-004	DD-402	BYA10D4	B-240	5HK-D4	
C9	180				BPD-00018	DD-181	L10T18	B-318	5GA-T18	
C10	4000				BPD-004	DD-402	BYA10D4	B-240	5HK-D5	
C11	.05	400			P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	①
C12	.1	600			P688N-1	DF-104	CUB6P1	GEM-601	6TM-P1	
C13	2000				BPD-002	DD-202	BYA10D2	B-220	5HK-D2	
C14	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C15	5000				BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C16	470				BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C17	4000				BPD-004	DD-402	BYA10D4	B-240	5HK-D4	
C18	180				BPD-00018	DD-181	L10T18	B-318	5GA-T18	
C19	4000				BPD-004	DD-402	BYA10D4	B-240	5HK-D4	
C20	.05	400			P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	①
C21	.1	600			P688N-1	DF-104	CUB6P1	GEM-601	6TM-P1	
C22	20000				BPD-02	DD-203	BYB6S2	B-120	5HK-S2	
C23	20000				BPD-02	DD-203	BYB6S2	B-120	5HK-S2	
C24	20000						CUB16S2	GEM-1612	MB-S2	
C25	20000						CUB16S2	GEM-1612	MB-S2	
C26	1.5	200					WMF2W1P5E	GEM-11P5		

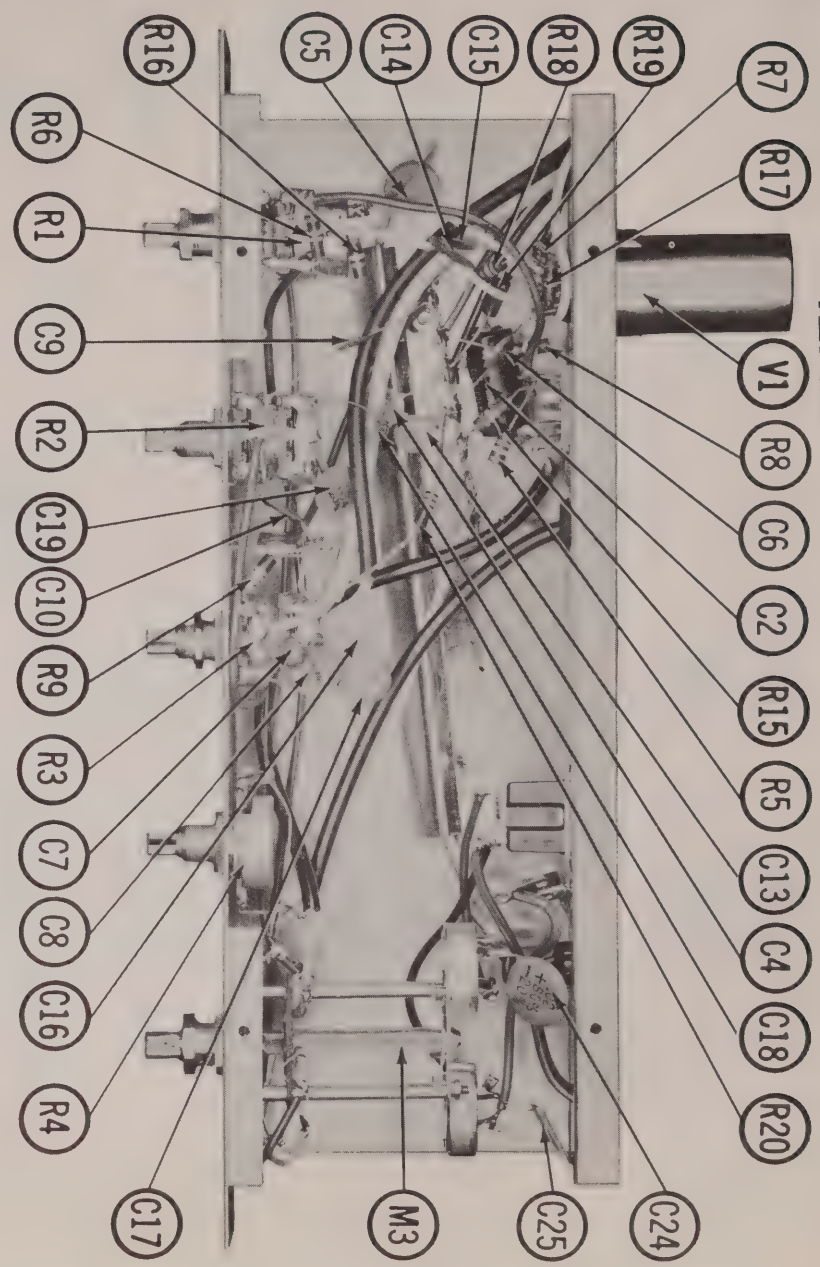
① Not used in some versions.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	COLUMBIA PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	2meg	1/2	9B588	B-76		Q13-139	† UE1873-S	Loudness, Channel B
B	2meg	1/2		SR-76		M13-139		Loudness, Channel A
C	Switch			KR-1		76-1		
R2A	2meg	1/2	9B587	B-76		Q13-139	‡ UE1877	Treble, Channel B
B	2meg	1/2		SR-76		M13-139		Treble, Channel A
R3A	2meg	1/2	9B587	B-76		Q13-139	‡ UE1877	Bass, Channel B
B	2meg	1/2		SR-76		M13-139		Bass, Channel A
R4	100K	1/2	9B586	BT-39				Balance, Tap ⓐ 50K

† "STA-LOC" Equivalent: FA26A, RU26A, CS3500, U841. ‡ "STA-LOC" Equivalent: FA26A, RU26A, CS3500.

PRE-AMP CHASSIS-BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	COLUMBIA PART No.	NOTES
R5	180K			
R6	100K			
R7	10meg			
R8	270K			
R9	470K			
R10	6.8meg			
R11	100K			
R12	2700Ω			
R13	100Ω			
R14	470K			
R15	180K			
R16	100K			
R17	10meg			
R18	270K			
R19	27K			
R20	470K			
R21	6.8meg			
R22	100K			
R23	100Ω			
R24	470K			
R25	270Ω	5	16B414	
R26	2700Ω			
R27	8200Ω	2		
R28	15K	2		Note 1
R29	15K			

Note 1. Some versions may use a 10K 1W in this application.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA COLUMBIA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V ⓐ .575A	630VCT ⓐ .075A	6.3V ⓐ 2.1A	2B107		P-3151		PC8407		R-9A ①

① Drill new mounting holes.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA COLUMBIA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	5000Ω CT	3-4Ω CT	3B225							① Drill new mounting hole.
T3	2300Ω	1-2Ω	3B226	24S63①		AU-607①	A-3825①	24S63 ①		

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	REPLACEMENT DATA COLUMBIA PART No.	QUAM PART No.	NOTES
SP1	12"	PM	9-10Ω	1B136 ①	12A6A	① Models 632, 637
SP2	3½"	PM	3-4Ω	1B125 ②	3A07	② Model 632
SP3	3½"	PM	3-4Ω	1B125 ②	3A07	③ External Speaker Model 637
SP4	3½"	PM	3-4Ω	1B125 ②	3A07	
	5"	PM		1B135 ③		

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA COLUMBIA PART No.	ASTATIC PART No. CARTRIDGE	ASTATIC PART No. NEEDLE	JENSEN PART No. CARTRIDGE	JENSEN PART No. NEEDLE	ELECTRO-VOICE PART No. CARTRIDGE	ELECTRO-VOICE PART No. NEEDLE	REMARKS
M1		13TB *						* Includes needle & mounting mechanism

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA COLUMBIA PART No.	JENSEN PART No.	WALCO PART No.	REMARKS
M2	SC-1	SC-1X †		† Jewel

MISCELLANEOUS

ITEM No.	PART NAME	COLUMBIA PART No.	NOTES
M3	Switch	19B616	Function

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	8B483	Model 632
Knob	8B494	Model 637
Cabinet	17B978	Mahogany, Model 632
Cabinet	17B979	Blond, Model 632
Cabinet	17B980	Walnut, Model 632
Cabinet	17B805	Mahogany, Model 637
Cabinet	17B996	Blond, Model 637
Cabinet	17B997	Walnut, Model 637
Cabinet	17B802	External Cabinet, Mahogany, Model 637
Cabinet	17B803	External Cabinet, Blond, Model 637
Cabinet	17B804	External Cabinet, Walnut, Model 637

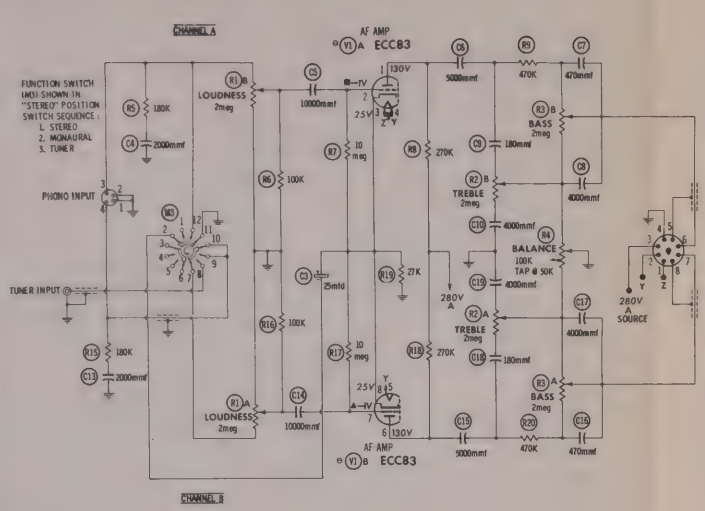
WIRING DATA

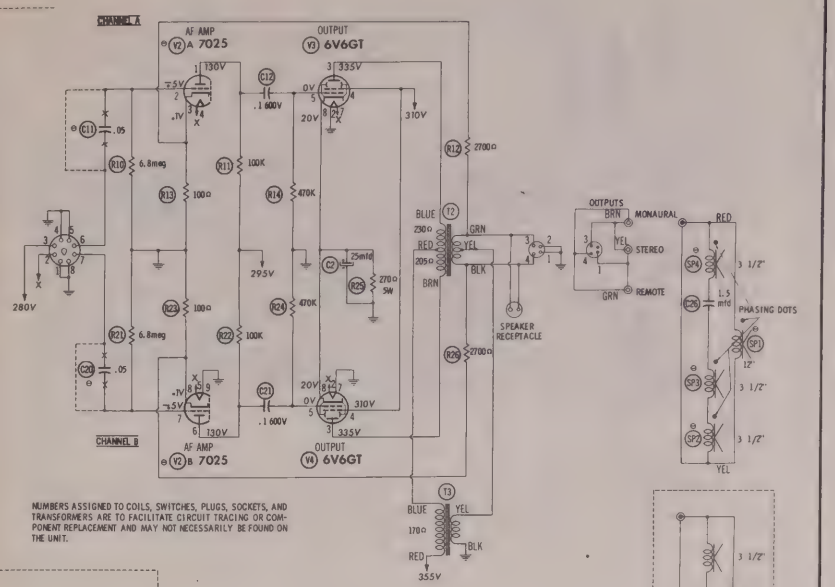
General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

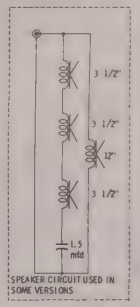
Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

Low-Loss Shielded Lead (Interconnecting) .....Use BELDEN No. 8401

Phono Pick-up Arm Cable ..... Use BELDEN No. 8430 (Two Conductor - Twisted)







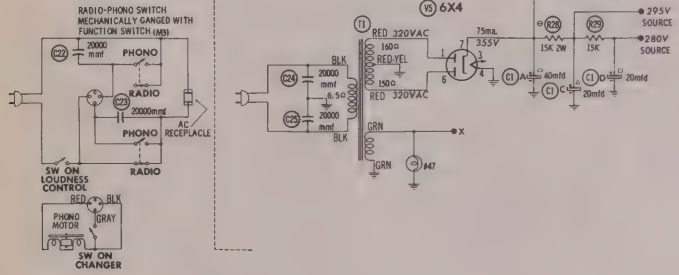
RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	ECC83 12AX7	†300K	10meg	27K	.1Ω	.1Ω	†295K	10meg	27K	0Ω
V2	7025	†115K	6.8meg	100Ω	.1Ω	.1Ω	†115K	6.8meg	100Ω	0Ω
V3	6V6GT	NC	0Ω	†400Ω	†8200Ω	470K	NC	.1Ω	270Ω	
V4	6V6GT	NC	.1Ω	†375Ω	†8200Ω	470K	NC	0Ω	270Ω	
V5	6X4	160Ω	NC	.1Ω	0Ω	NC	150Ω	¶		

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
† MEASURED FROM PIN 7 OF V5.
■ MEASURED FROM PIN 3 OF V1.
▲ MEASURED FROM PIN 8 OF V1.

NC NO CONNECTION.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings
6. All controls at minimum, proper output load connected.



● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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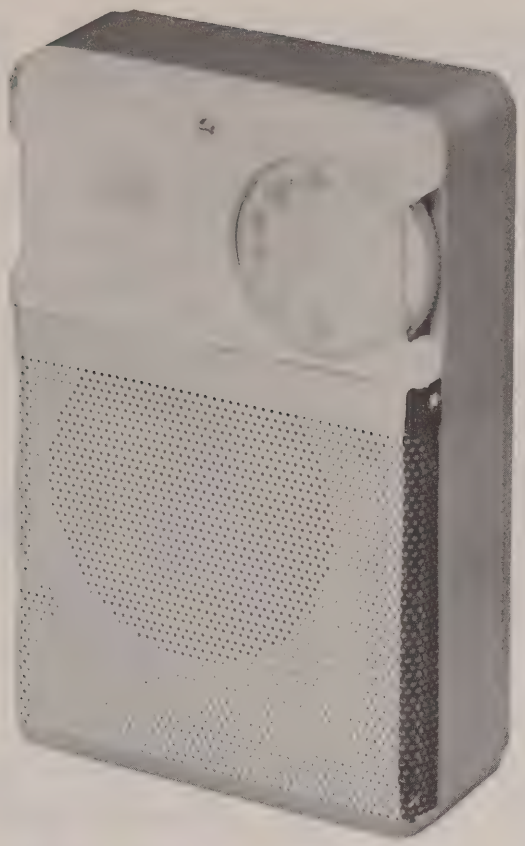
COLUMBIA MODELS 632M, 637

PHOTOFACT* Folder
with CIRCUITRACE*

CROWN
MODEL TR-333

CROWN
MODEL TR-333



TRADE NAME	Crown Model TR-333
IMPORTER	Shriro, Inc., 276 Fourth Ave., New York 10, N. Y.
TYPE SET	Battery Operated Portable Transistorized AM Receiver
POWER SUPPLY	9 Volts DC
TUNING RANGE—BROADCAST	525KC — 1650KC
RATING	6.5@9 Volts DC (No Signal, Min. Volume) 8.6@9 Volts DC (Signal, Normal Volume)

CROWN
MODEL TR-333

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.

Suggested alignment tools:
A1, A2, A3..... GENERAL CEMENT #5009, 8195, 8274, 8275, 8728, 8987
WALSCO #2531
A4, A5..... GENERAL CEMENT #9087, 9089
WALSCO #2528

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.		Loop	455KC (400~ Mod.)	Tuning gang fully open.	Across voice coil	A1, A2	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
2.		"	525KC	Tuning gang fully closed.	"	A3	Adjust for maximum output.
3.		"	1650KC	Tuning gang fully open.	"	A4, A5	"
4.		"	650KC	650KC	"	A6	"

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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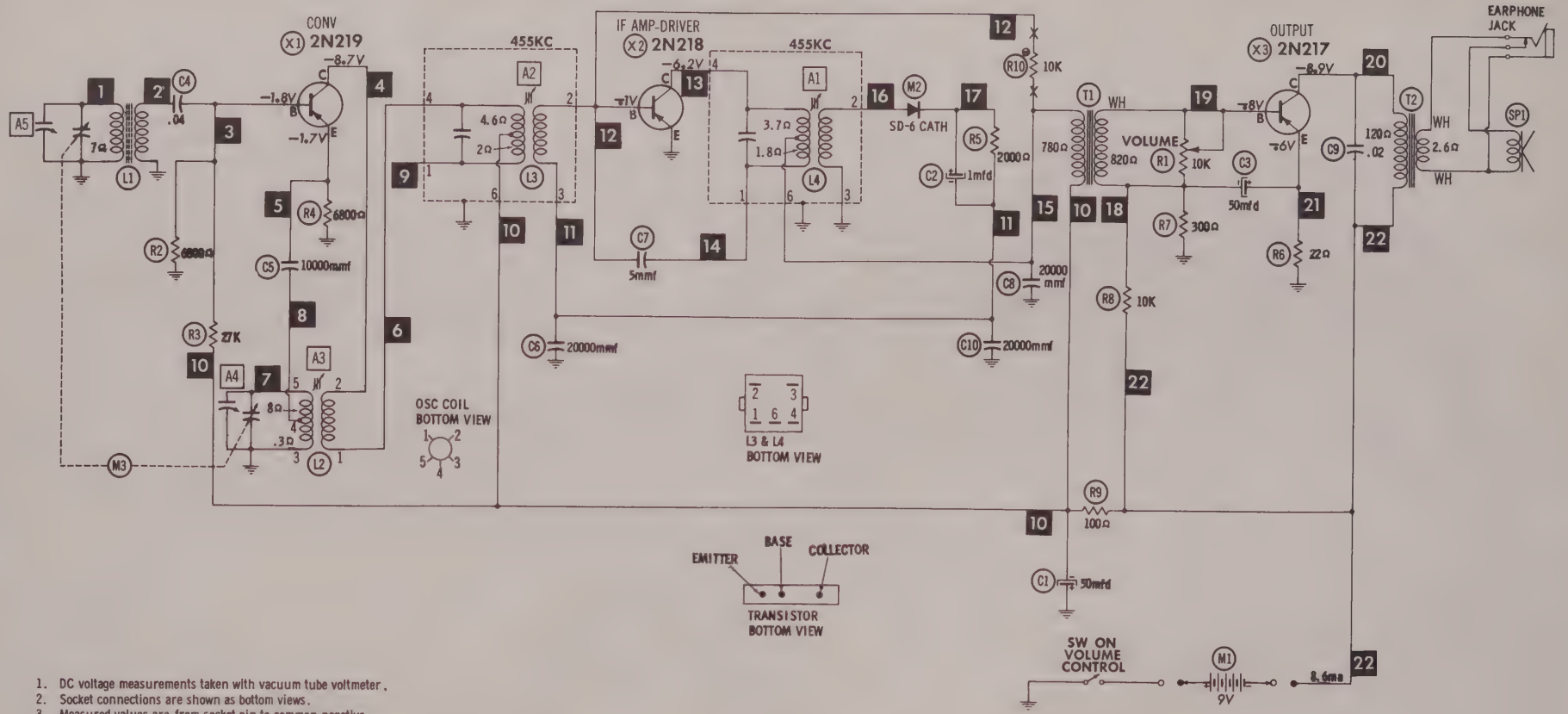
SET 456 FOLDER 8



1. DC voltage measurements taken with vacuum tube voltmeter.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE MEASUREMENTS NOT GIVEN BECAUSE OF THE WIDE VARIATION IN INTERNAL TRANSISTOR RESISTANCE.

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE®

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CROWN MODEL TR-333

PARTS LIST AND DESCRIPTIONS

TRANSISTORS

ITEM No.	ORIG. TYPE	USE	REPLACEMENT DATA				NOTES
			CBS PART No.	RCA PART No.	RAYTHEON PART No.	SYLVANIA PART No.	
X1	2N219	Converter		2N219	2N486		PNP
X2	2N218	IF Amplifier-Driver		2N218	2N484		PNP
X3	2N217	Output		2N217	2N631	2N217	PNP

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	CROWN PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	
C1	50	10		XPP-10050	NLW50-10	TT10X50	ML50-15	TE-1119	
C2	1	6		XPP-6001	NLW3-6	TT12X1	ML1-6	TE-1080	
C3	50	10		XPP-10050	NLW50-10	TT10X50	ML50-15	TE-1119	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	CROWN PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4	.04	50				DDA-503	H-05S5	TA-150	TG-S50	
C5	10000				C-80V103M	DM-103	H-05S1	TA-110	TG-S10	
C6	20000				C-80V203AM	DDM-203	H-05S2	TA-120	TG-S20	
C7	5				NPO-SI 5	DD-050	L10V5	ZT-555	5GA-V5	
C8	20000				C-80V203AM	DDM-203	H-05S2	TA-120	TG-S20	
C9	.02	50				DDM-203	H-05S2	TA-120	TG-S20	
C10	20000				C-80V203AM	DDM-203	H-05S2	TA-120	TG-S20	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	CROWN PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	10K	1/4		B16-216				Volume & Switch

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		CROWN PART No.	NOTES
	OHMS	WATT		
R2	6800Ω			
R3	27K			
R4	6800Ω			
R5	2000Ω			
R6	22Ω			

ITEM No.	RATING		CROWN PART No.	NOTES
	OHMS	WATT		
R7	300Ω			
R8	10K			
R9	100Ω			
R10	100K			Note 1

Note 1. Not used in some versions.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA						NOTES
		CROWN PART No.	Gramer PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	Loopstick							
L2	Osc. Coil							
L3	Input IF Trans.	6046						
L4	Output IF Trans.	6047						

PRINTED BOARD

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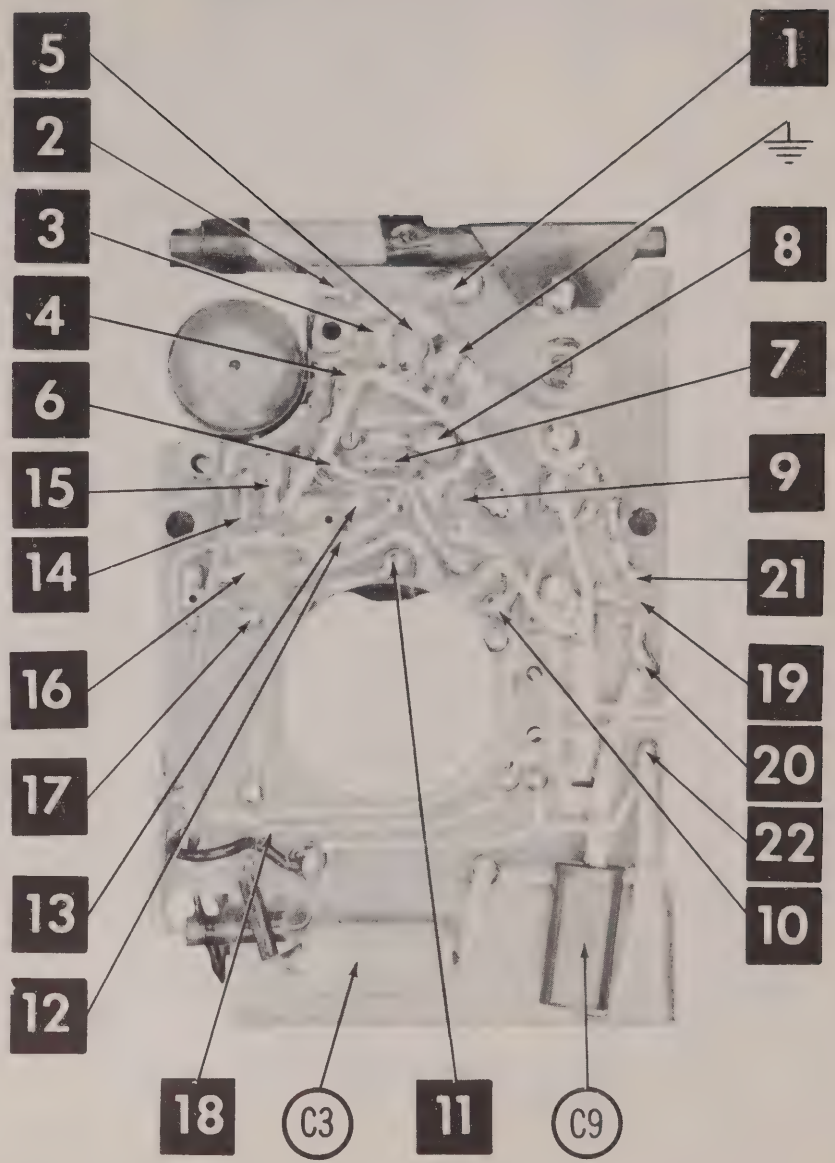


PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (DRIVER)

ITEM No.	TURNS RATIO		REPLACEMENT DATA						NOTES
	PRI.	SEC.	CROWN PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	1	1	TRT-11B						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	CROWN PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	1000Ω	10Ω	TRT-6Y							

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	CROWN PART No.	QUAM PART No.	
SP1	2"	PM	10Ω			

BATTERIES

ITEM No.	VOLTAGE	CROWN PART No.	REPLACEMENT DATA						NOTES
			BURGESS		EVEREADY		MALLORY		
			"A"	"B"	"A"	"B"	"A"	"B"	
M1	9V			2U6		216		TR-146R	

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		CROWN PART No.	CBS PART No.	SYLVANIA PART No.	
M2	SD-6		1N60	1N295	Detector (Pigtail)

MISCELLANEOUS

ITEM No.	PART NAME	CROWN PART No.	NOTES
M3	Tuning Cap		2 Gang

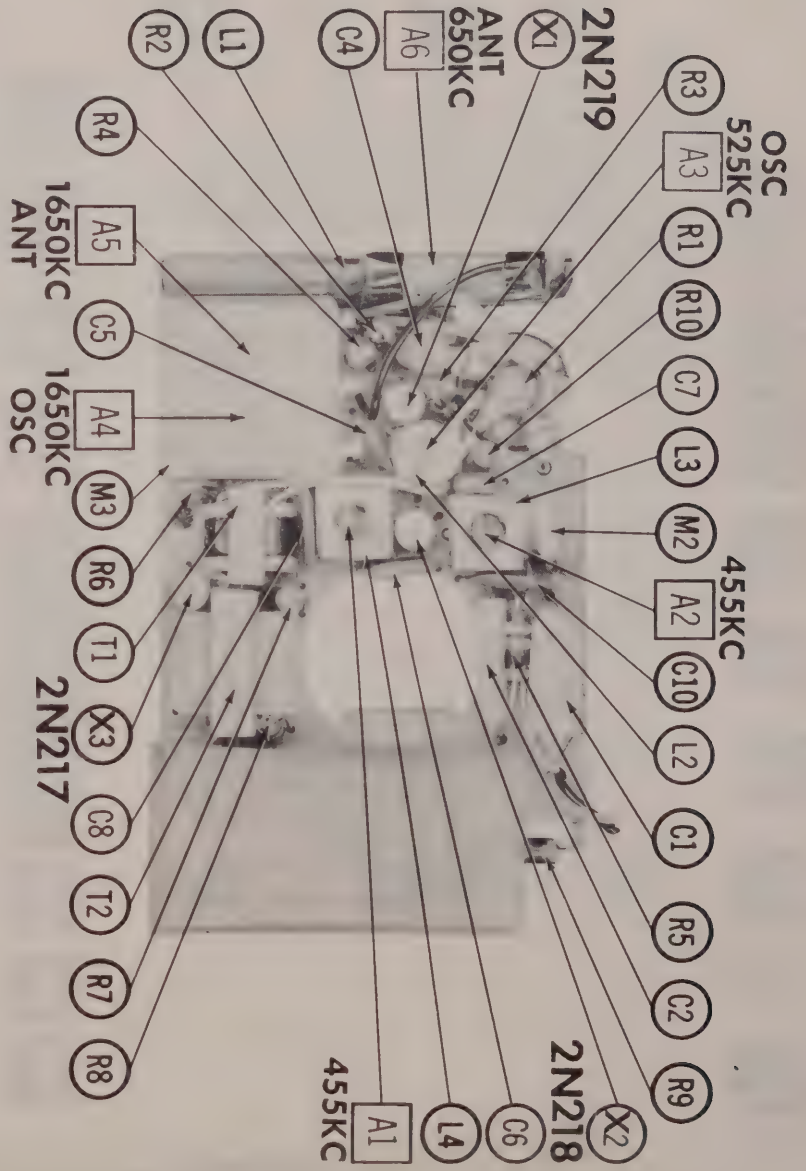
CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

WIRING DATA

General-use Unshielded Hook-up Wire .....Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

CHASSIS—TOP VIEW

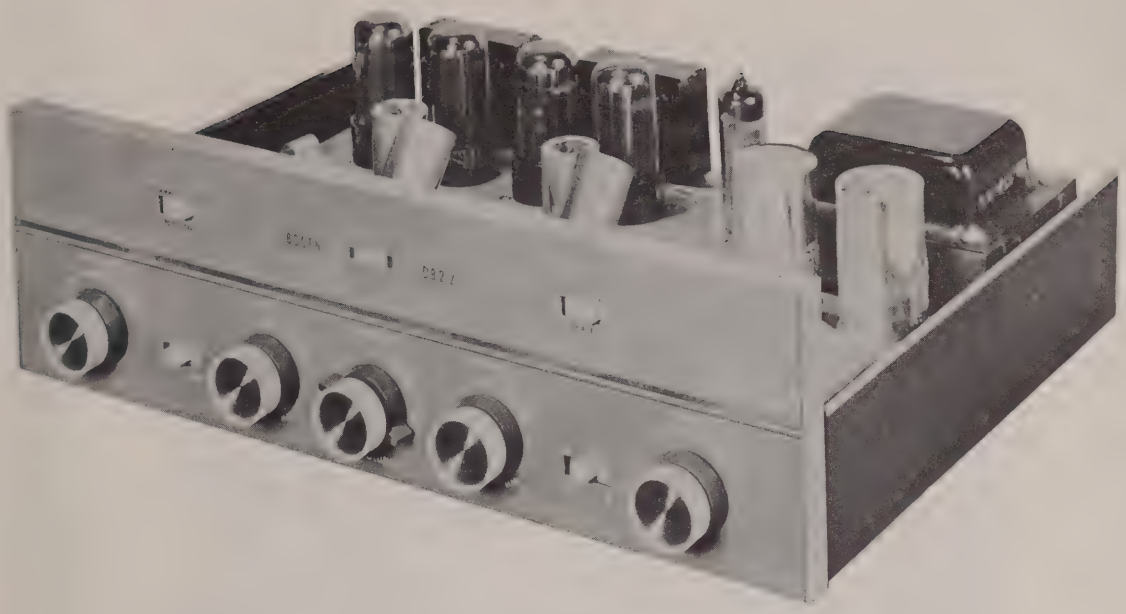


PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

DAVID BOGEN
MODEL DB212

DAVID BOGEN
MODEL DB212



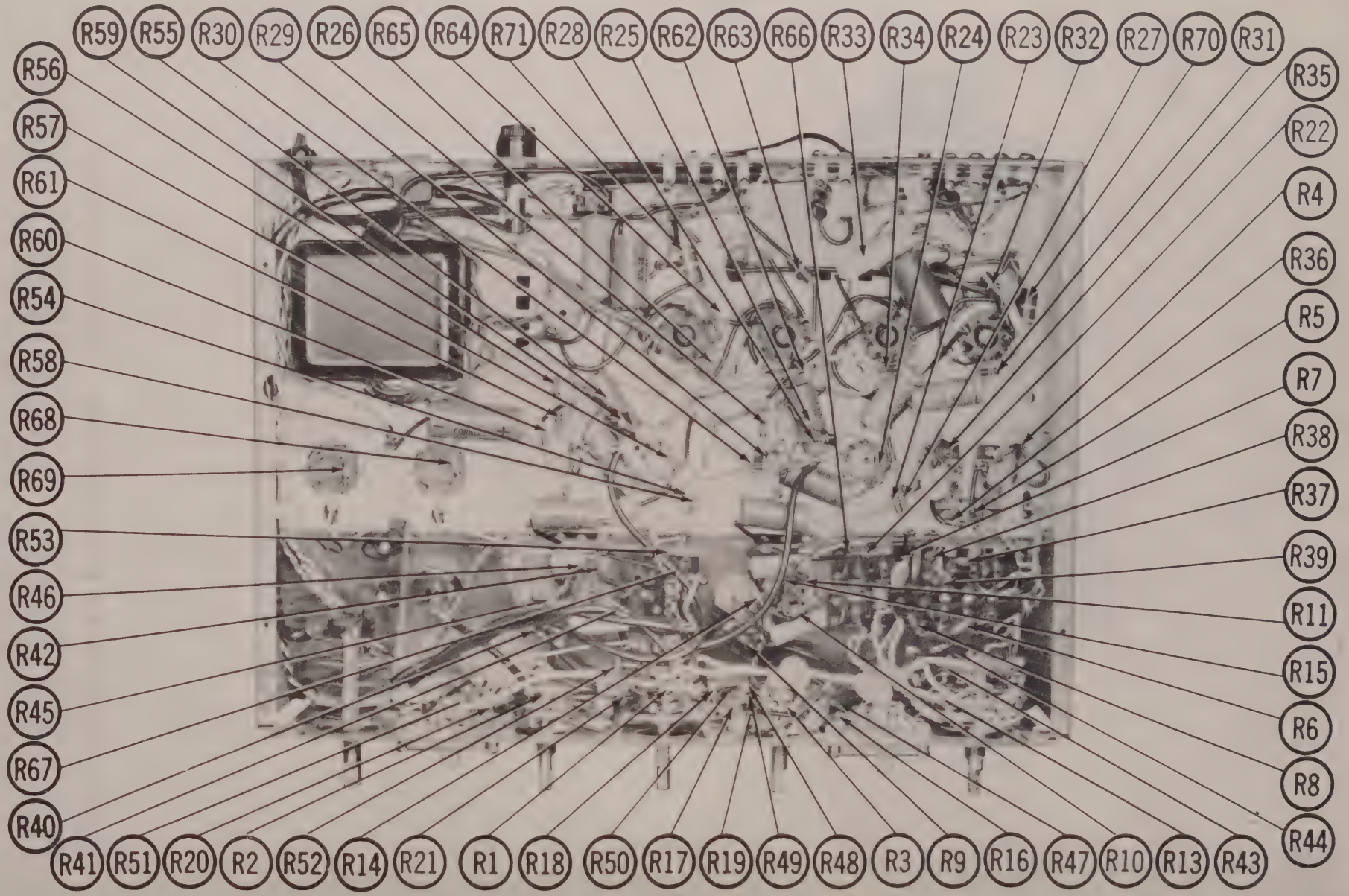
DAVID BOGEN
MODEL DB212

TRADE NAME	David Bogen Model DB212
MANUFACTURER	David Bogen Co., Inc., P. O. Box 500, Paramus, N. J.
TYPE SET	AC Operated 9 Tube Stereo Amplifier
POWER SUPPLY	110-120 Volts AC, 60 Cycles RATING 100 Watts, 1 Amp. @ 117 Volts AC

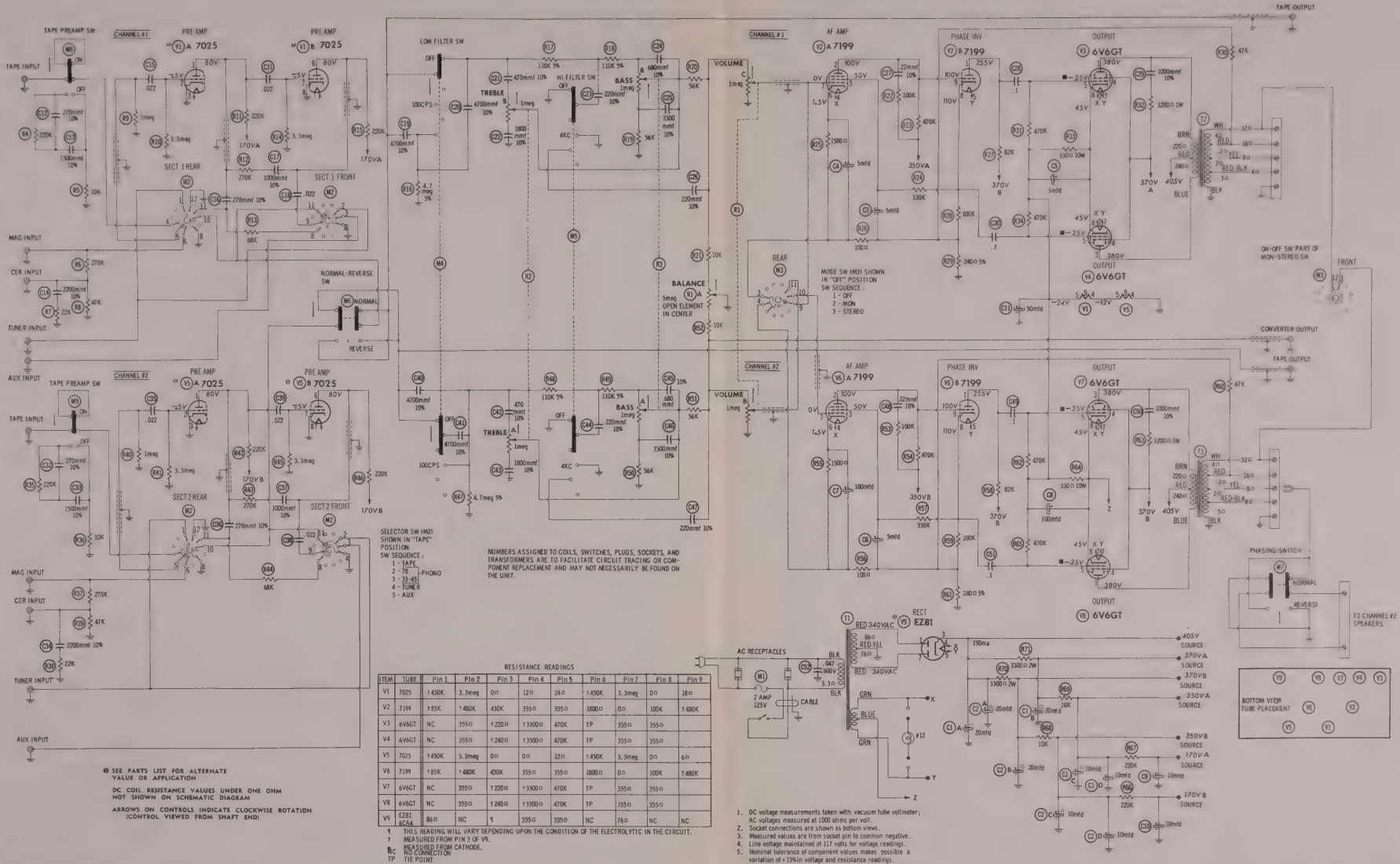
HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1959 Howard W. Sams & Co., Inc., Indianapolis 6, Indiana. Printed in U.S. of America

JV201



CHASSIS BOTTOM VIEW - RESISTOR IDENT



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	7025	↑450K	3.3meg	0Ω	12Ω	24Ω	↑450K	3.3meg	0Ω	18Ω
V2	7199	↑85K	↑480K	430K	355Ω	355Ω	1800Ω	0Ω	100K	↑480K
V3	6V6GT	NC	355Ω	↑220Ω	↑3300Ω	470K	TP	355Ω	355Ω	
V4	6V6GT	NC	355Ω	↑240Ω	↑3300Ω	470K	TP	355Ω	355Ω	
V5	7025	↑450K	3.3meg	0Ω	0Ω	12Ω	↑450K	3.3meg	0Ω	6Ω
V6	7199	↑85K	↑480K	430K	355Ω	355Ω	1800Ω	0Ω	100K	↑480K
V7	6V6GT	NC	355Ω	↑220Ω	↑3300Ω	470K	TP	355Ω	355Ω	
V8	6V6GT	NC	355Ω	↑240Ω	↑3300Ω	470K	TP	355Ω	355Ω	
V9	EZ81 6CA4	86Ω	NC	¶	355Ω	355Ω	NC	76Ω	NC	NC

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
↑ MEASURED FROM PIN 3 OF V9.
MEASURED FROM CATHODE.
NC NO CONNECTION
TP TIE POINT

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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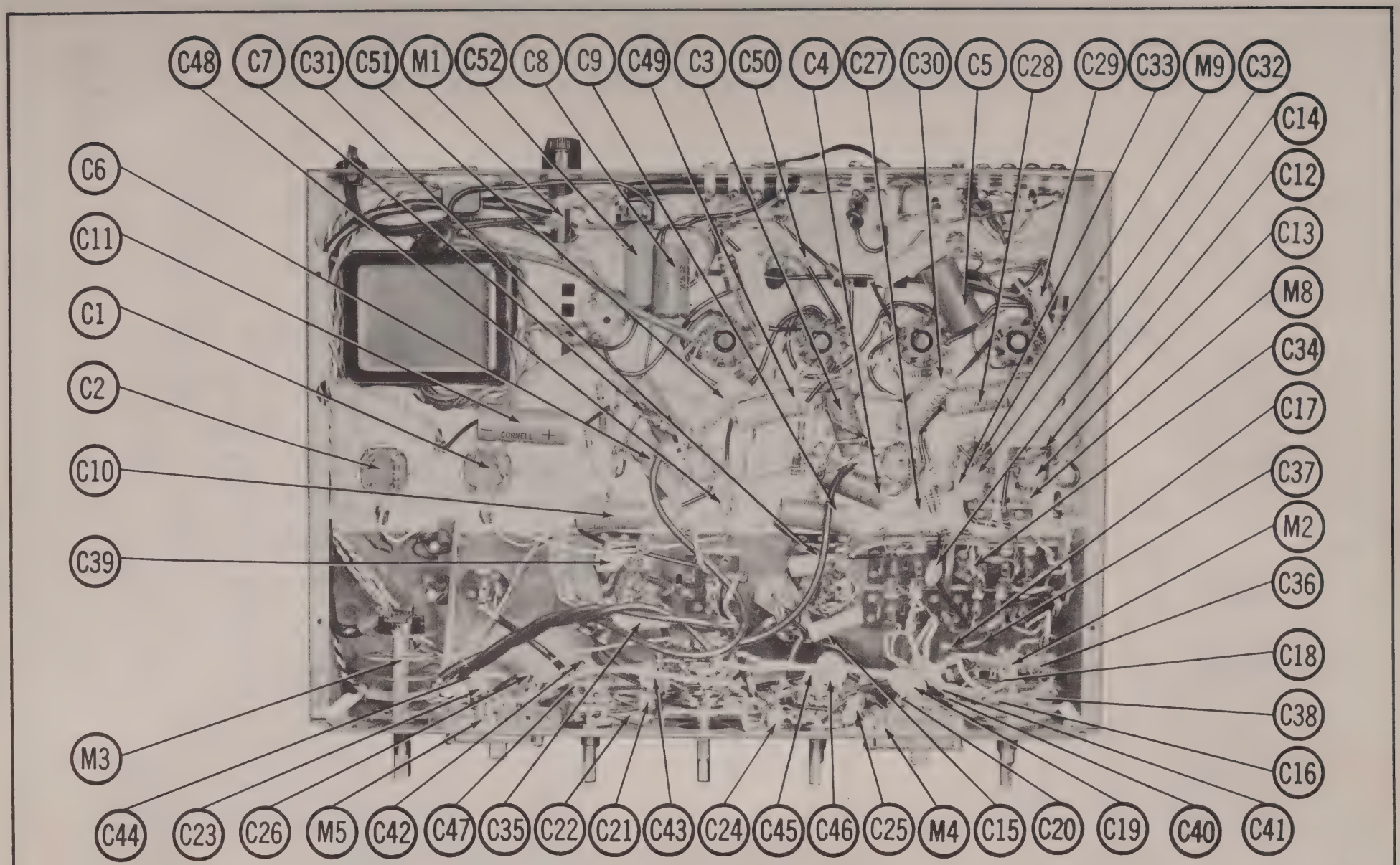
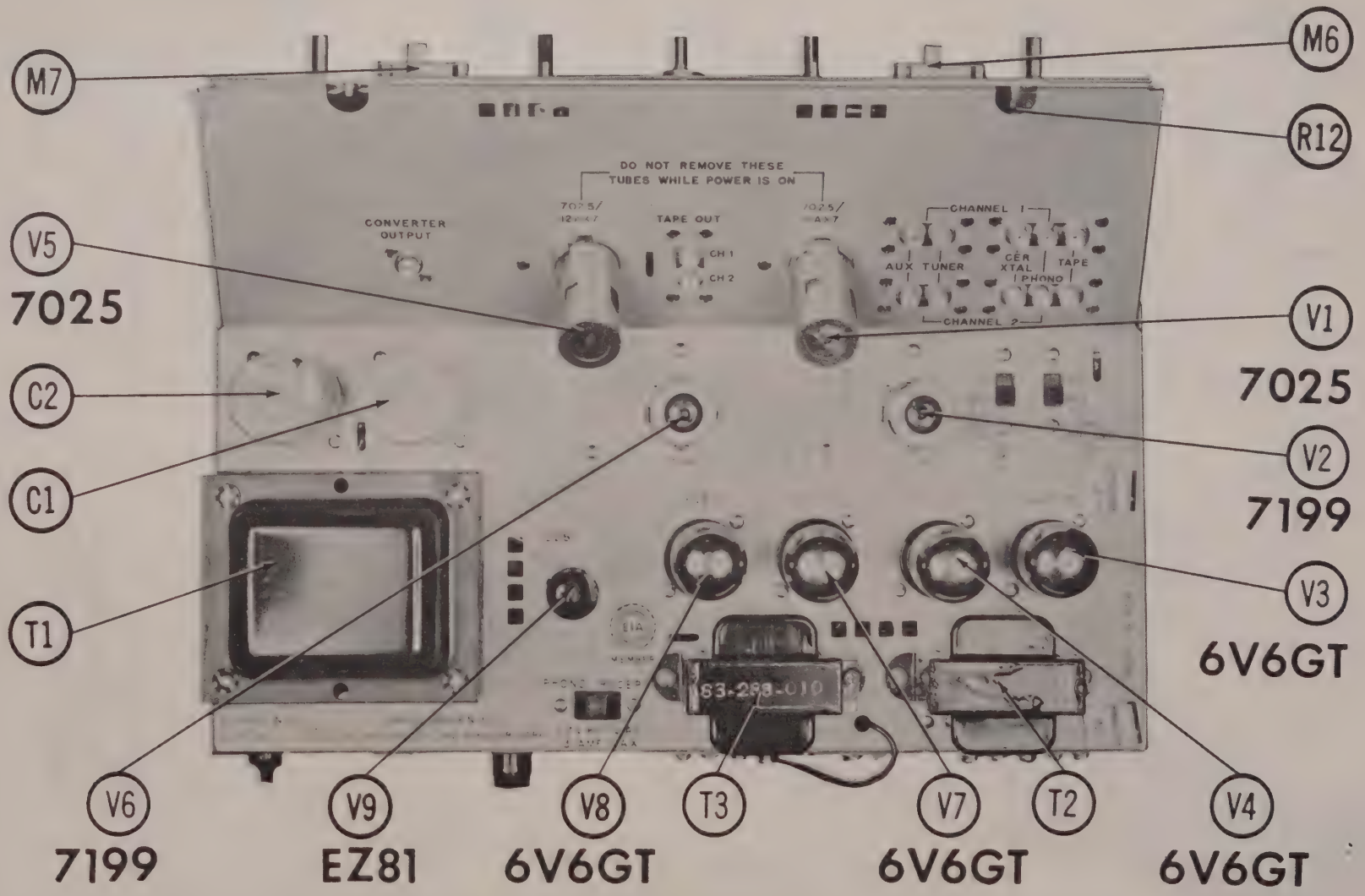
DAVID BOGEN MODEL DB212



CHASSIS BOTTOM VIEW - CAPACITOR & MISC IDENT



CHASSIS - TOP VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Channel 1 Preamp.	7025	①
V2	Channel 1 AF Amp. - Phase Inverter	7199	
V3	Channel 1 Output	6V6GT	
V4	Channel 1 Output	6V6GT	

① Alternate 12AX7

ITEM No.	USE	TYPE	NOTES
V5	Channel 2 Preamp.	7025	①
V6	Channel 2 AF Amp. - Phase Inverter	7199	
V7	Channel 2 Output	6V6GT	
V8	Channel 2 Output	6V6GT	
V9	Rectifier	EZ81/6CA4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	David Bogen PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	
C1A	▲20	450	79-010-001	AFH3-36	C0270	FP376.5	TMT-34	TVL-3780	
B	■20	450							
C	▲10	350							
D	10	350							
C2A	▲20	450	79-010-001	AFH3-36	C0270	FP376.5	TMT-34	TVL-3780	
B	■20	450							
C	▲10	350							
D	10	350							
C3	5	200	79-001-086	PRS250V4	BBR4-250	TC50X	TD8-250	TVA-1501	
C4	5	200	79-001-086	PRS250V4	BBR4-250	TC50X	TD8-250	TVA-1501	
C5	5	200	79-001-086	PRS250V4	BBR4-250	TC50X	TD8-250	TVA-1501	
C6	5	200	79-001-086	PRS250V4	BBR4-250	TC50X	TD8-250	TVA-1501	
C7	100	6	79-001-026	PRS6V10	BBR100-6	TT6X100	TD-100-6	TVA-1101	
C8	100	6	79-001-026	PRS6V10	BBR100-6	TT6X100	TD-100-6	TVA-1101	
C9	10	25	79-001-046	PRS25V10	BBR10-25	TC25	TD-10-25	TVA-1204	
C10	10	25	79-001-046	PRS25V10	BBR10-25	TC25	TD-10-25	TVA-1204	
C11	50	50	79-001-057	PRS50V50	BR505	TC39	TD-50-50	TVA-1308	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	David Bogen PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C12	270		10%		DI-270	D6-271	L10T27		5GA-T27S 10%*	
C13	1500		10%		DI-1500		PM6D15	JL-215	6TM-D15	
C14	2200		10%		DI-2200		PM6D22	JL-222	6TM-D22	
C15	.022	200			P288N-022	DD-203	CUB4S22	GEM-4122	2TM-S22	
C16	270		10%		DI-270	D6-271	L10T27		5GA-T27S 10%*	
C17	1000		10%		DI-1000		PM6D1	JL-210	6TM-D1	
C18	.022	200			P288N-022	DD-203	CUB4S22	GEM-4122	2TM-S22	
C19	4700		10%		DI-4700		PM6D47	JL-247	6TM-D47	
C20	4700		10%		DI-4700		PM6D47	JL-247	6TM-D47	
C21	470		10%		DI-470	D6-471		JL-347	5GA-T47S 10%*	
C22	1800		10%		DI-1800			JL-218	5GA-D18S 10%*	
C23	220		10%		DI-220	D6-221	L10T22	JL-322	5GA-T22S 10%*	
C24	680		10%		DI-680	D6-681		JL-368	5GA-T68S 10%*	
C25	3300		10%		DI-3300		PM6D33	JL-233	6TM-D33	
C26	220		10%		DI-220	D6-221	L10T22	JL-322	5GA-T22S 10%*	
C27	22		10%		DI-22	DD-220	L10Q22	CNO-422	5GA-Q22S 10%*	
C28	.1	400			P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C29	1000		10%		DI-1000	DD-102	PM6D1	JL-210	6TM-D1	
C30	.1	400			P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C31	.022	200			P288N-022	DD-203	CUB4S22	GEM-4122	2TM-S22	
C32	270		10%		DI-270	D6-271	L10T27		5GA-T27S 10%*	
C33	1500		10%		DI-1500		PM6D15	JL-215	6TM-D15	
C34	2200		10%		DI-2200		PM6D22	JL-222	6TM-D22	
C35	.022	200			P288N-022	DD-203	CUB4S22	GEM-4122	2TM-S22	
C36	270		10%		DI-270	D6-271	L10T27		5GA-T27S 10%*	
C37	1000		10%		DI-1000		PM6D1	JL-210	6TM-D1	
C38	.022	200			P288N-022	DD-203	CUB4S22	GEM-4122	2TM-S22	
C39	.022	200			P288N-022	DD-203	CUB4S22	GEM-4122	2TM-S22	
C40	4700		10%		DI-4700		PM6D47	JL-247	6TM-D47	
C41	4700		10%		DI-4700		PM6D47	JL-247	6TM-D47	
C42	470		10%		DI-470	D6-471		JL-347	5GA-T47S 10%*	
C43	1800		10%		DI-1800			JL-218	5GA-D18S 10%*	
C44	220		10%		DI-220	D6-221	L10T22	JL-322	5GA-T22S 10%*	

CAPACITORS (cont)

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	David Bogen PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C45	680		10%		DI-680	D6-681		JL-368	5GA-T68S 10%*	
C46	3300		10%		DI-3300		PM6D33	JL-233	6TM-D33	
C47	220		10%		DI-220	D6-221	L10T22	JL-322	5GA-T22S 10%*	
C48	22		10%		DI-22	DD-220	L10Q22	CNO-422	5GA-Q22S 10%*	
C49	.1	400			P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C50	1000		10%		DI-1000		PM6D1	JL-210	6TM-D1	
C51	.1	400			P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C52	.047	600			P688N-047		CUBI6S5	GEM-1615	TR-15	

* Not normally in distributor's stock. Available thru distributor on order to manufacturer.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	David Bogen PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	5meg *		77-001-455					Balance
B	1meg							Volume, Chan. 2
C	1meg							Volume, Chan. 1
R2A	1meg		77-001-446	B-70	AD47-1meg-2	Q13-137		Treble, Chan. 2
B	1meg			SR-70	Not Req.	M13-137	† UE3913	Treble, Chan. 1
C	Shaft			Not Req.	FS-3	Not Req.		
R3A	1meg		77-001-446	B-70	AD47-1meg-2	Q13-137		Bass, Chan. 2
B	1meg			SR-70	Not Req.	M13-137	† UE3913	Bass, Chan. 1
C	Shaft			Not Req.	FS-3	Not Req.		

* Open element in center.
† "STA-LOC" equivalent: FA16A, RU16A, CS3500.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		David Bogen PART No.	NOTES
	OHMS	WATT		
R4	220K			
R5	10K			
R6	270K			
R7	22K			
R8	47K			
R9	1meg			
R10	3.3meg			
R11	220K			
R12	270K			
R13	68K			
R14	3.3meg			
R15	220K			
R16	4.7meg5%			
R17	110K 5%			
R18	110K 5%			
R19	56K			
R20	56K			
R21	10K			
R22	100K			
R23	470K			
R24	330K			
R25	1500Ω			
R26	100Ω			
R27	82K			
R28	100K			
R29	240Ω 5%			
R30	47K			
R31	470K			
R32	1200Ω	1		
R33	330Ω	10		
R34	470K			
R35	220K			
R36	10K			
R37	270K			

ITEM No.	RATING		David Bogen PART No.	NOTES
	OHMS	WATT		
R38	22K			
R39	47K			
R40	1meg			
R41	3.3meg			
R42	220K			
R43	270K			
R44	68K			
R45	3.3meg			
R46	220K			
R47	4.7meg5%			
R48	110K 5%			
R49	110K 5%			
R50	56K			
R51	56K			
R52	10K			
R53	100K			
R54	470K			
R55	1500Ω			
R56	100Ω			
R57	330K			
R58	82K			
R59	100K			
R60	47K			
R61	240Ω 5%			
R62	470K			
R63	1200Ω	1		
R64	330Ω	10		
R65	470K			
R66	220K			
R67	220K			
R68	10K			
R69	10K			
R70	3300Ω	2		
R71	3300Ω	2		

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	David Bogen PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ 1A	680 VCT @ .150A	6.3 VCT @ 3.6A	83-572-000						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	David Bogen PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	5600Ω CT	32Ω Tap @ 16Ω 8Ω, 4Ω	83-288①	24S61	A-2901②	AU-609	A-3870	24S61	S-55X	① Alternate Part #83-275-000. ② Drill new mounting hole
T3	5600Ω CT	32Ω Tap @ 16Ω 8Ω, 4Ω	83-288①	24S61	A-2901②	AU-609	A-3870	24S61	S-55X	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			David Bogen PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	2A 125V S/B			313002. (3AG 2A 125V S/B)	342001	MDL-2	HKP

MISCELLANEOUS

ITEM No.	PART NAME	David Bogen PART No.	NOTES
M2	Switch	81-001-465	Selector (Rotary Type)
M3	Switch	81-001-466	Mode Off-Mono-Stereo (Rotary Type)
M4A	Switch	81-003-005	Lo Fil. (DPDT, Slide Type) Channel 1
B	Switch		Lo Fil. Channel 2
M5A	Switch	81-003-005	Hi Fil. (DPDT, Slide Type) Channel 1
B	Switch		Hi Fil. Channel 2
M6	Switch	81-003-002	Norm-Reverse (DPDT, Slide Type)
M7	Switch	81-003-002	Phase (DPDT, Slide Type)
M8	Switch	S381A	Tape Preamp.(DPDT, Slide Type) Channel 1
M9	Switch	S381A	Tape Preamp.(DPDT, Slide Type) Channel 2

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

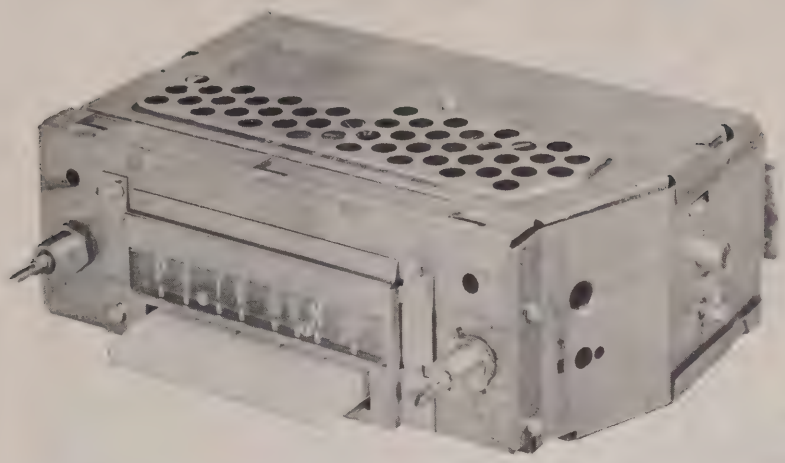
Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

PHOTOFACT* Folder with CIRCUITRACE*

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

EDSEL
MODEL 94BE

EDSEL
MODEL 94BE



TRADE NAME	Edsel Model 94BE (B9KF-18805-D, B9KF-18806-C) For 1959 Edsel Automobiles
MANUFACTURER	Bendix Radio Div., Bendix Aviation Corp., East Joppa Road, Baltimore 4, Maryland
TYPE SET	Battery Operated 4 Tube Custom Built Automobile AM Receiver With Transistorized Output
POWER SUPPLY	12 Volt Storage Battery
RATING	1.1 Amp. @12.6 Volts DC
TUNING RANGE—BROADCAST	435-1605KC

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Set Volume at MINIMUM. Set Tone fully clockwise. Use only enough generator output to provide a reading of 1 to 2 volts on VTVM.

Suggested alignment tools:

A1 thru A4.....GENERAL CEMENT #8606, 8606L, 8282, 9295
WALSCO #2526, 2543, 2544, 2545

A5, A6.....GENERAL CEMENT #5000, 5003, 5014, 5015, 5016, 8276, 8290
WALSCO #2512, 2515, 2522, 2523, 2525, 2537

A8, A9, A10.....GENERAL CEMENT #9050L, 9150
WALSCO #2521

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1mfd	High side to pin 7 (grid) of Converter. Low side to chassis.	262.5KC (400~ Mod.)	Hi-End stop	DC probe to point (A). Common to chassis.	A1, A2, A3, A4	Adjust for maximum output.
2.	Fig. 1.	Thru dummy antenna to antenna receptacle.	1605KC	"	"	A5, A6, A7	"
	If a tuning core or coil has been replaced, preset A8, A9, A10 clockwise until they just remain in coil forms. Repeat Step 2.						
3.	Fig. 1	Thru dummy to antenna receptacle.	1180KC	.285 inch carriage movement from high end stop.	DC probe to point (A). Common to chassis.	A8, A9, A10	Adjust for maximum output. Repeat Steps 2 & 3.
	With radio installed in car and antenna fully extended, tune in a weak station near 1600KC and adjust A7 for maximum output.						

PUSHBUTTON ADJUSTMENT

1. Tune manually to desired station.
2. Pull button out; then press in firmly.
3. Repeat for remaining buttons.

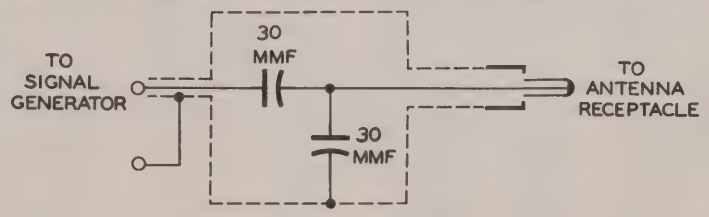


FIG. 1

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of JD223

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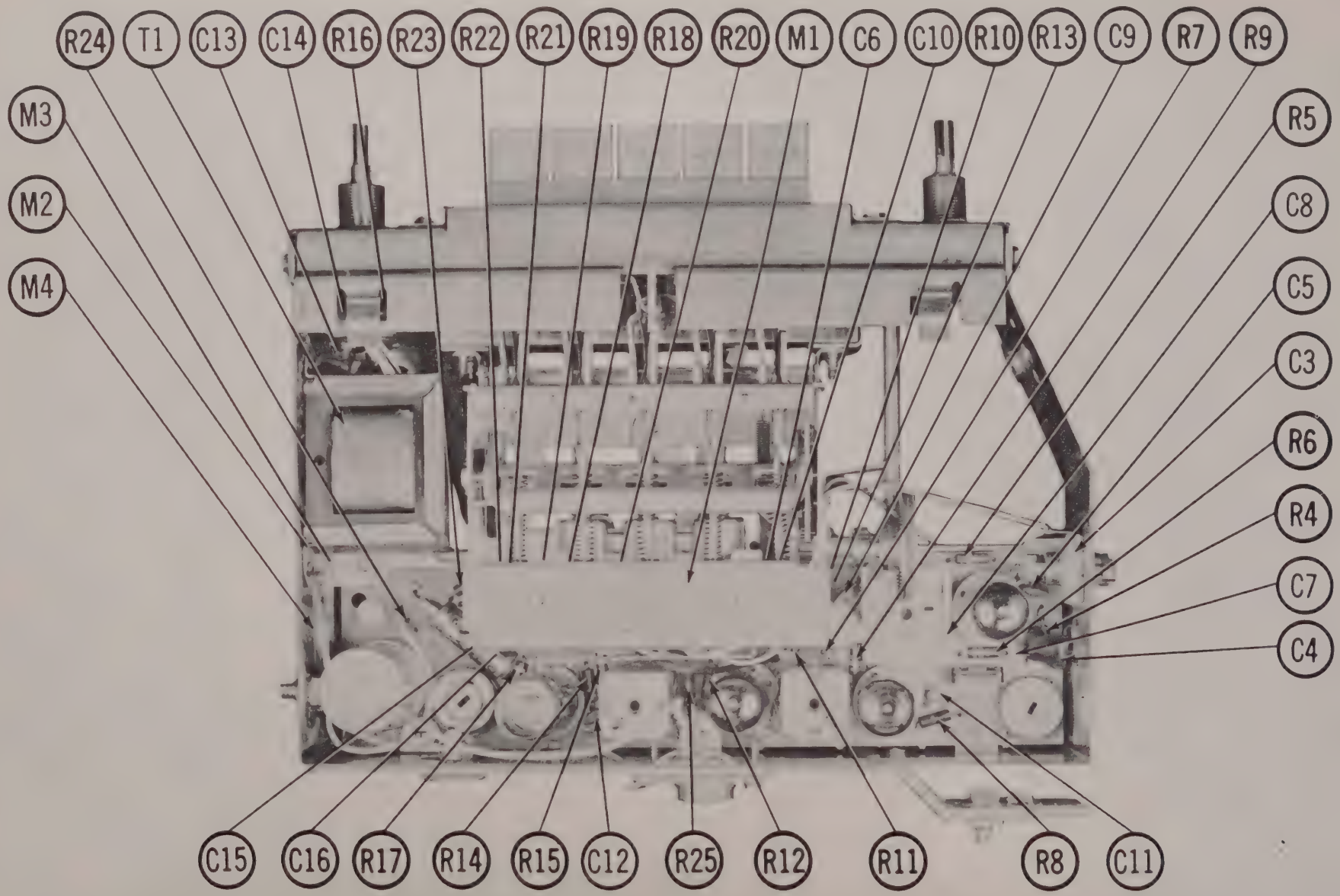
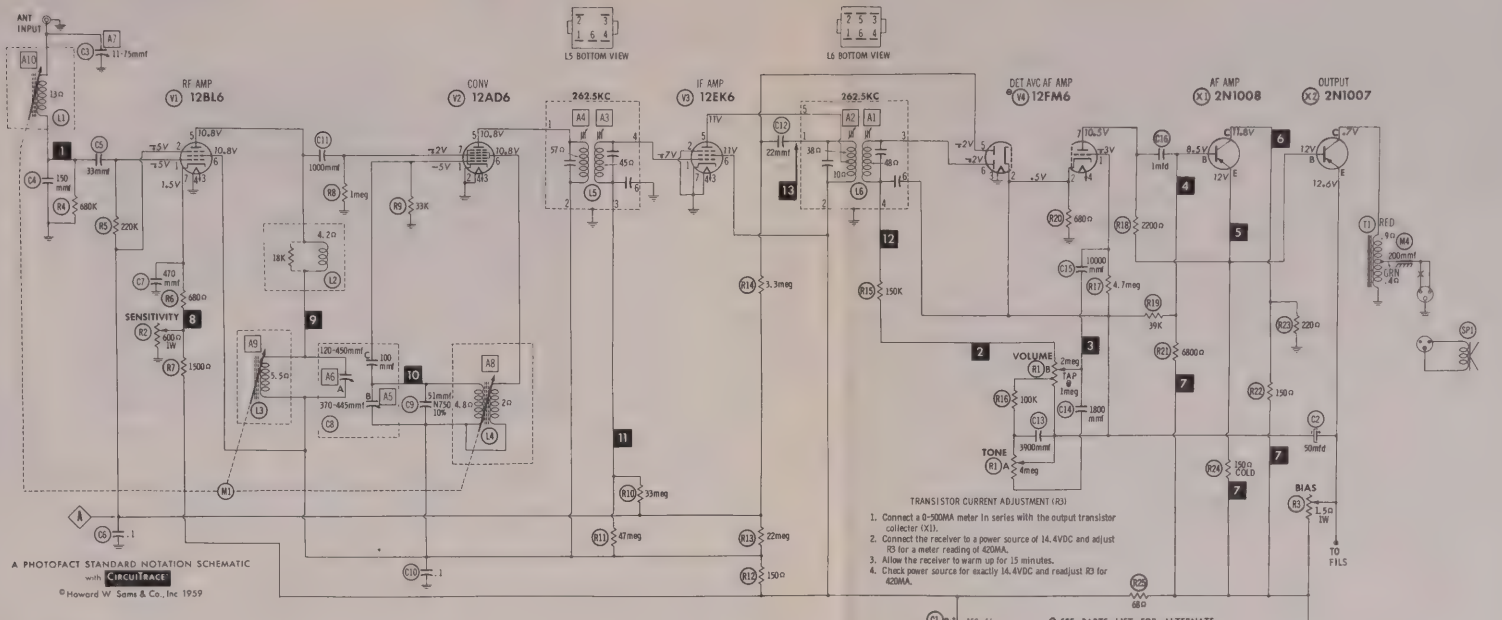
SET 456 FOLDER 10



CHASSIS TOP VIEW - CAPACITOR, RESISTOR, & MISC IDENT


ANT INPUT
RF AMP V1 12BL6
CONV V2 12AD6
IF AMP V3 12EK6
262.5KC
L5 BOTTOM VIEW
DET AVC AF AMP V4 12FM6
AF AMP X1 2N1008
OUTPUT X2 2N1007
SENSITIVITY
VOLUME
TONE
BIAS
TRANSISTOR CURRENT ADJUSTMENT (R3)
1. Connect a 0-500MA meter in series with the output transistor collector (X1).
2. Connect the receiver to a power source of 14.4VDC and adjust R3 for a meter reading of 420MA.
3. Allow the receiver to warm up for 15 minutes.
4. Check power source for exactly 14.4VDC and readjust R3 for 420MA.
A PHOTOFACT STANDARD NOTATION SCHEMATIC
with CIRCUITRACE
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⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

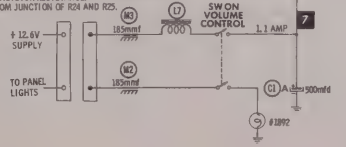
DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter.
2. Socket connections shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Battery voltage maintained at 12.6 volts for voltage readings
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings
6. Volume control at maximum, no signal applied for voltage measurements.

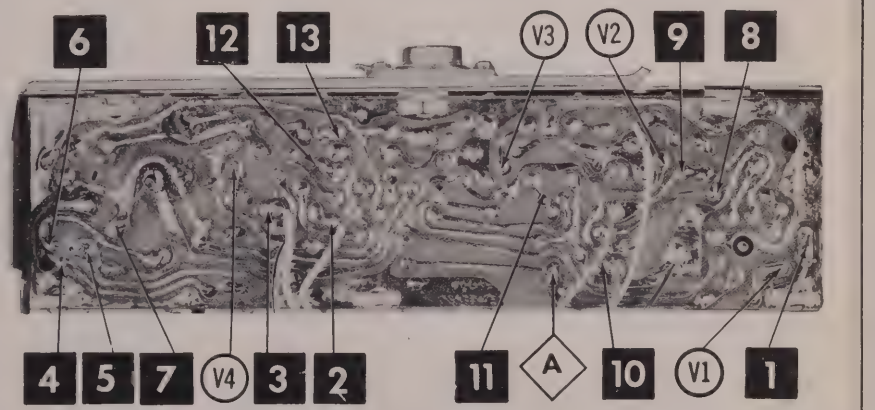
RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12BL6	20meg	20meg	3Ω	0Ω	†225Ω	†220Ω	850Ω
V2	12AD6	33K	0Ω	0Ω	0Ω	†280Ω	†220Ω	1meg
V3	12EK6	30meg	0Ω	3Ω	0Ω	†75Ω	†68Ω	0Ω
V4	12FM6	4.7meg	680Ω	0Ω	3Ω	20meg	2meg	†2300Ω

TRANSISTOR CIRCUIT RESISTANCE NOT GIVEN BECAUSE OF THE WIDE VARIATION IN INTERNAL TRANSISTOR RESISTANCE.
† MEASURED FROM JUNCTION OF R24 AND R25.



EDSEL MODEL 94BE



A Howard W. Sams CIRCUITRACE Photo

PRINTED BOARD

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier	12BL6	
V2	Converter	12AD6	
V3	IF Amplifier	12EK6	
V4	Det-AVC-AF Amp.	12FM6	12FK6 *

* Alternate.

TRANSISTORS

ITEM No.	ORIG. TYPE	USE	REPLACEMENT DATA				NOTES
			CBS PART No.	RCA PART No.	RAYTHEON PART No.	SYLVANIA PART No.	
X1	2N1008	Driver			2N1008		PNP
X2	2N1007	Output	2N301				PNP Note 1

Note 1. When replacing, apply silicone grease to both sides of insulator.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	BENDIX PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	
C1A	500	16	220353-12	AFH2-02-75	B0045 ‡	PWP200.6		PCLS-2175*	
B	100	16							
C2	50	16	2090480-1	SRE25V50	BBR50-25	TC29	TD-50-25	TE-1209	

‡ Use printed circuit adaptor #55277 and 55278.
* Not normally in distributor's stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	BENDIX PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	4-75			219083-1						
C4	150			220350-601	1469-00015	DD-151	22R5T15	MC236	MS-315	
C5	33			220332-35	BPD-000033	DD-330	L10Q33	CNO-433	5GA-Q33	
C6	.1	100		220352-11	P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C7	470			220332-38	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C8A	120-450			219092-2						
B	370-445									
C	100									

CAPACITORS (cont)

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	BENDIX PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C9	51		N750 10%	220332-16		TCN-51	C10Q51U		5TCU-Q51S 10%*	
C10	.1	100		220352-11	P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C11	1000			220332-48	BPD-001	DD-102	BYA10D1	B-210	5HK-D1	
C12	22			220332-61	BPD-000022	DD-220	L10Q22	CNO-422	5GA-Q22	
C13	3900			2090058U-392M	BPD-0039	DD-392	BYA10D39	B-239	5HK-D39	
C14	1800			2090058U-182M	DI-1800	DD-182	BYB5S2	B-218	5HK-D18	
C15	10000			2090207-9	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C16	1mfd	3		2090150-1	P123S-1.0		WMF1W1E	GEM-21	2TM-M1	

* Not normally in distributor's stock. Available thru distributor on order to manufacturer.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	BENDIX PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	4meg	½	2090035-3	F1-82		QJ998A	‡ UE396IS	Tone
B	2meg	½		R2-75		†		Volume, Tap ⓐ 1meg
C	Switch			KR-4				
R2	600Ω	1(ww)	2090181-2				PFL600	Sensitivity
R3	1.5Ω	1(ww)	2090181-7				PFL1.5	Bias

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		BENDIX PART No.	NOTES
	OHMS	WATT		
R4	680K		220604B-684	
R5	220K		220604B-224	
R6	680Ω		220604B-681	
R7	1500Ω		220604B-152	
R8	1meg		220604B-105	
R9	33K		220604B-333	
R10	33meg		220604B-336	
R11	47meg		220604B-476	
R12	150Ω		220604B-151	
R13	22meg		220604B-226	
R14	3.3meg		220604B-335	

ITEM No.	RATING		BENDIX PART No.	NOTES
	OHMS	WATT		
R15	150K		220604B-154	
R16	100K		220604B-104	
R17	4.7meg		220604B-475	
R18	2200Ω		220604B-222	
R19	39K		220603B-393	
R20	680Ω		220604B-681	
R21	6800Ω		220603B-682	
R22	150Ω		220604B-151	
R23	220Ω		220604B-221	
R24	150ΩCold		220629-9	
R25	68Ω		220604B-680	

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA						NOTES
		BENDIX PART No.	Gramer PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	Ant. Tuning Coil	†						
L2	RF Choke							①
L3	RF Tuning Coil	†						
L4	Osc. Tuning Coil	†						
L5	Input IF Trans.	2090907-2						
L6	Output IF Trans.	2090908-3						
L7	"A" Lead Choke	216188-11						130uh

† Part of M1 or Tuner Coil Ass'y. Part #2090131-1 (Oak) or Part #2090131-14 (RCC)
① Alt. Part #2090088-1. Includes 18K Resistor.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	BENDIX PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	8Ω	Tap ⓐ 3-4Ω	2090038-3							

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	BENDIX PART No.	QUAM PART No.	
SP1	6"x 9"	PM	3-4Ω	282634-3	69A2	

MISCELLANEOUS

ITEM No.	PART NAME	BENDIX PART No.	NOTES
M1	Tuner	2090102-5	Complete Assembly
M2	Spark Plate	220267-14	185mmf
M3	Spark Plate	220267-14	185mmf
M4	Spark Plate	220267-9	200mmf
	Printed Board	2090264-1	

CABINETS & CABINET PARTS

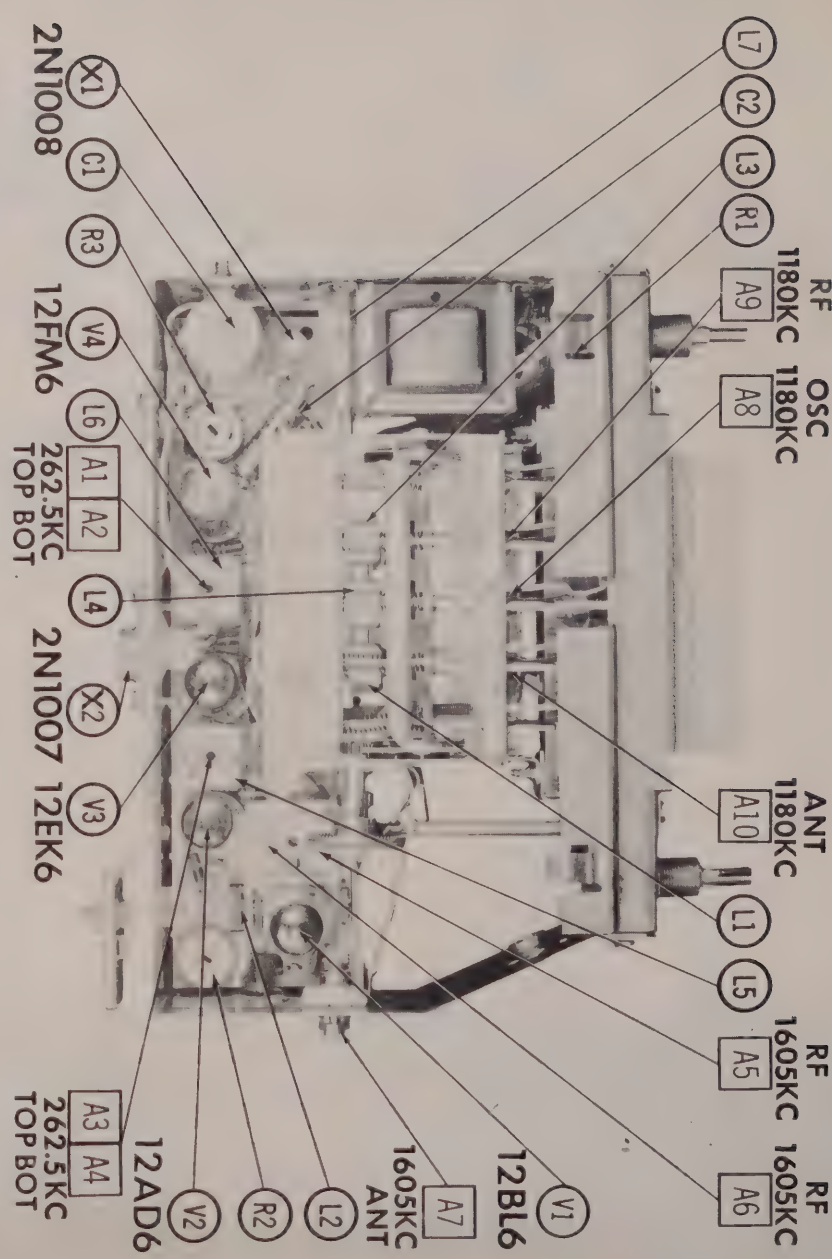
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	2090290-1	Tuning-Volume
Pushbutton	686576-3	
Dial	676312-3	
Pointer	2090129-15	Oak Tuner
Pointer	2090129-14	RCC Tuner

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Shielded Hook-up Wire	Use BELDEN No. 8885
Bonding Strap	Use BELDEN No. 8661

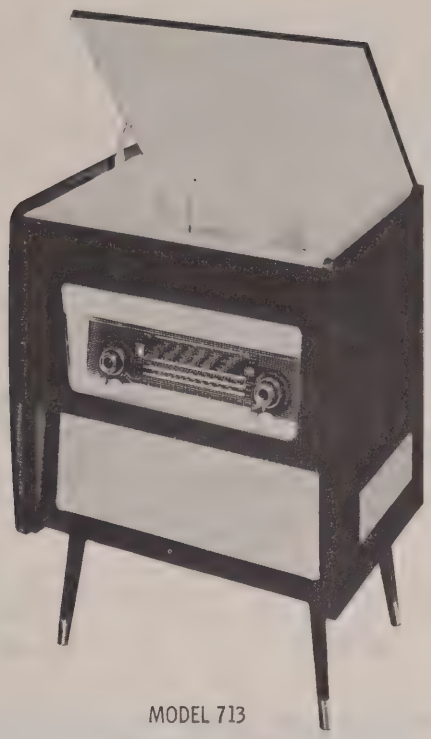
CHASSIS—TOP VIEW



PHOTOFACT* Folder

EMUD MODELS 703, 703ST, 713, 713ST, 723, 723ST

EMUD MODELS 703, 703ST, 713, 713ST, 723, 723ST



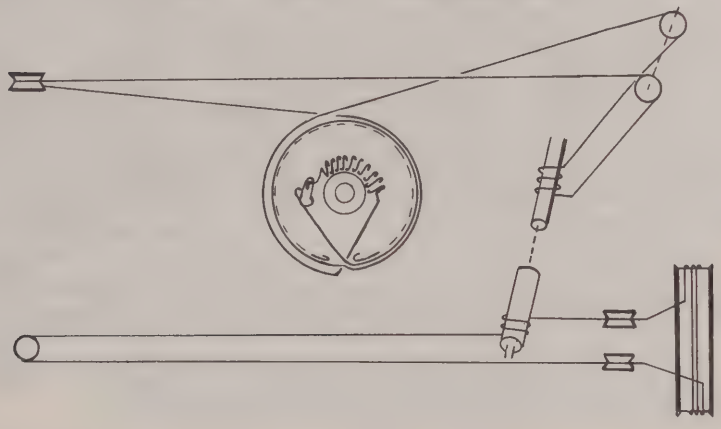
MODEL 713

EMUD MODELS 703, 703ST, 713, 713ST, 723, 723ST

TRADE NAME	Emud Models 703, 703ST, 713, 713ST, 723, 723ST		
IMPORTER	Delmonico International Corp., 42-24 Orchard Street, Long Island City 1, N. Y.		
TYPE SET	AC Operated 8 Tube FM-BC-SW Receiver With 4 Speed Automatic Record Changer		
POWER SUPPLY	110-120 Volts AC, 60 Cycles	RATING	72 Watts, .68 Amp. @117 Volts AC (FM) 66 Watts, .63 Amp. @117 Volts AC (AM)
TUNING RANGE—BROADCAST 515-1620KC SHORT WAVE 5.9-10MC FREQ. MOD. 88-108MC			

FOR SERVICE INFORMATION ON RECORD CHANGER — SEE SIMILAR MONARCH UA8 — PHOTOFACT SET 381 FOLDER 11

DIAL CORD STRINGING



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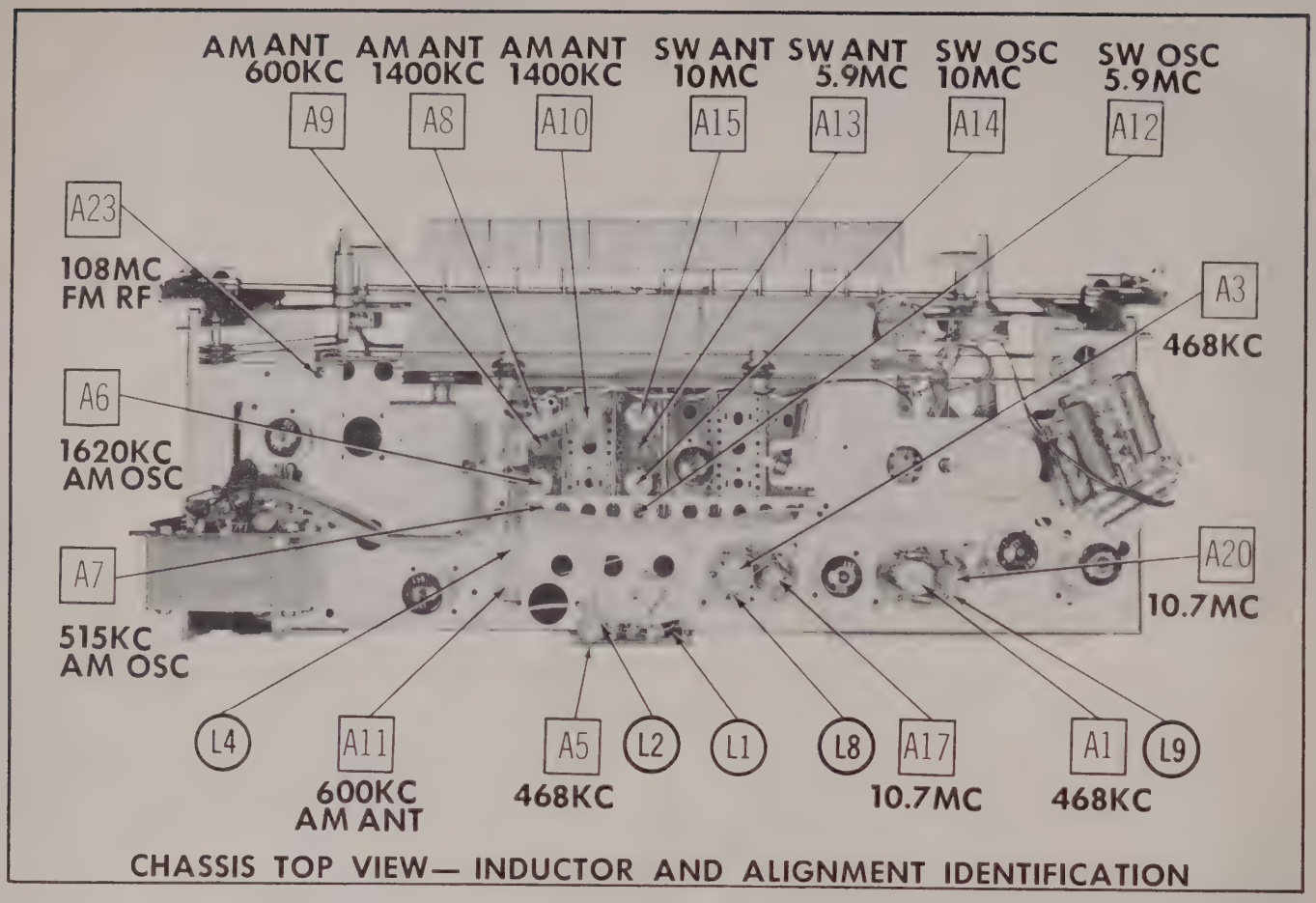
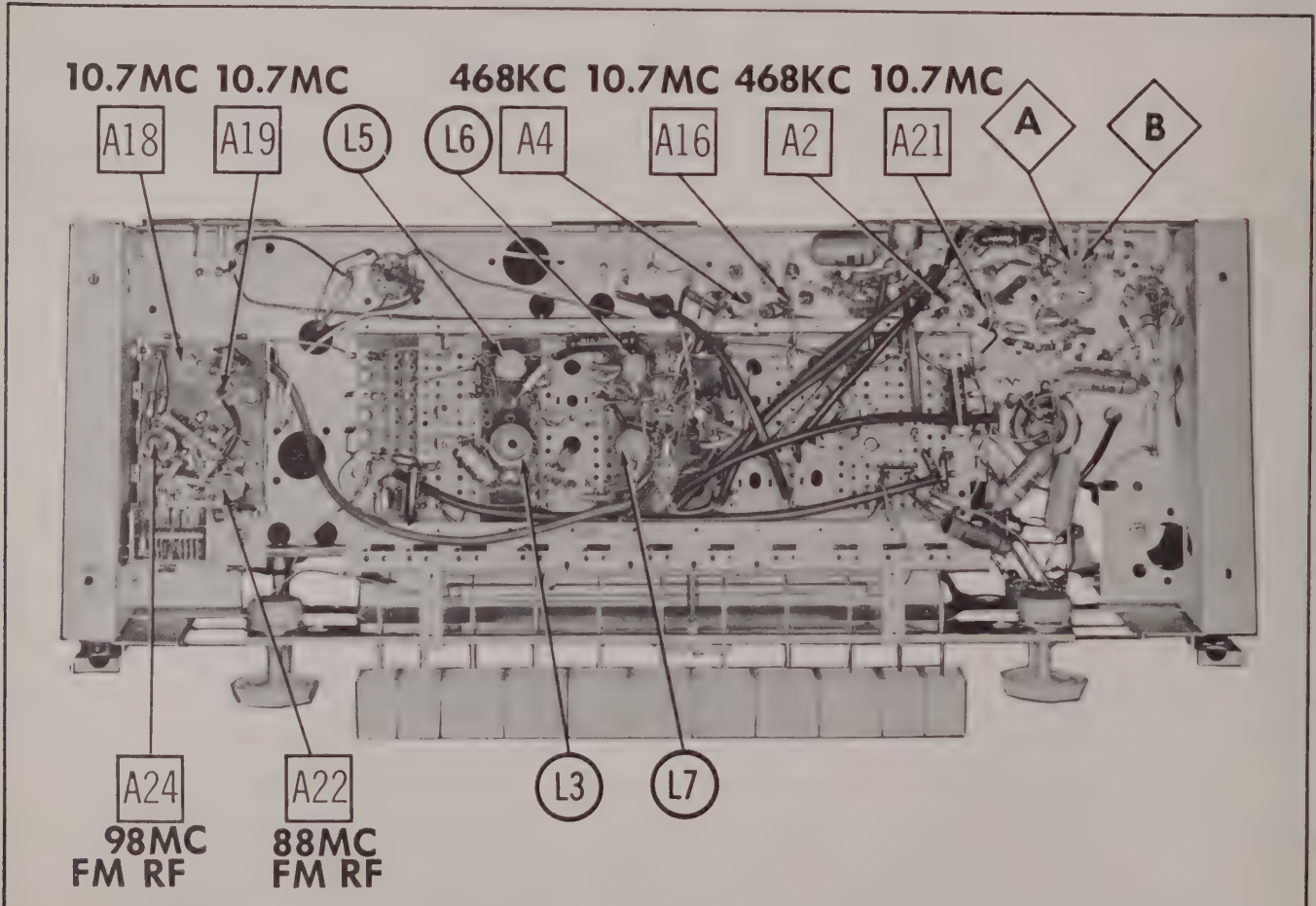
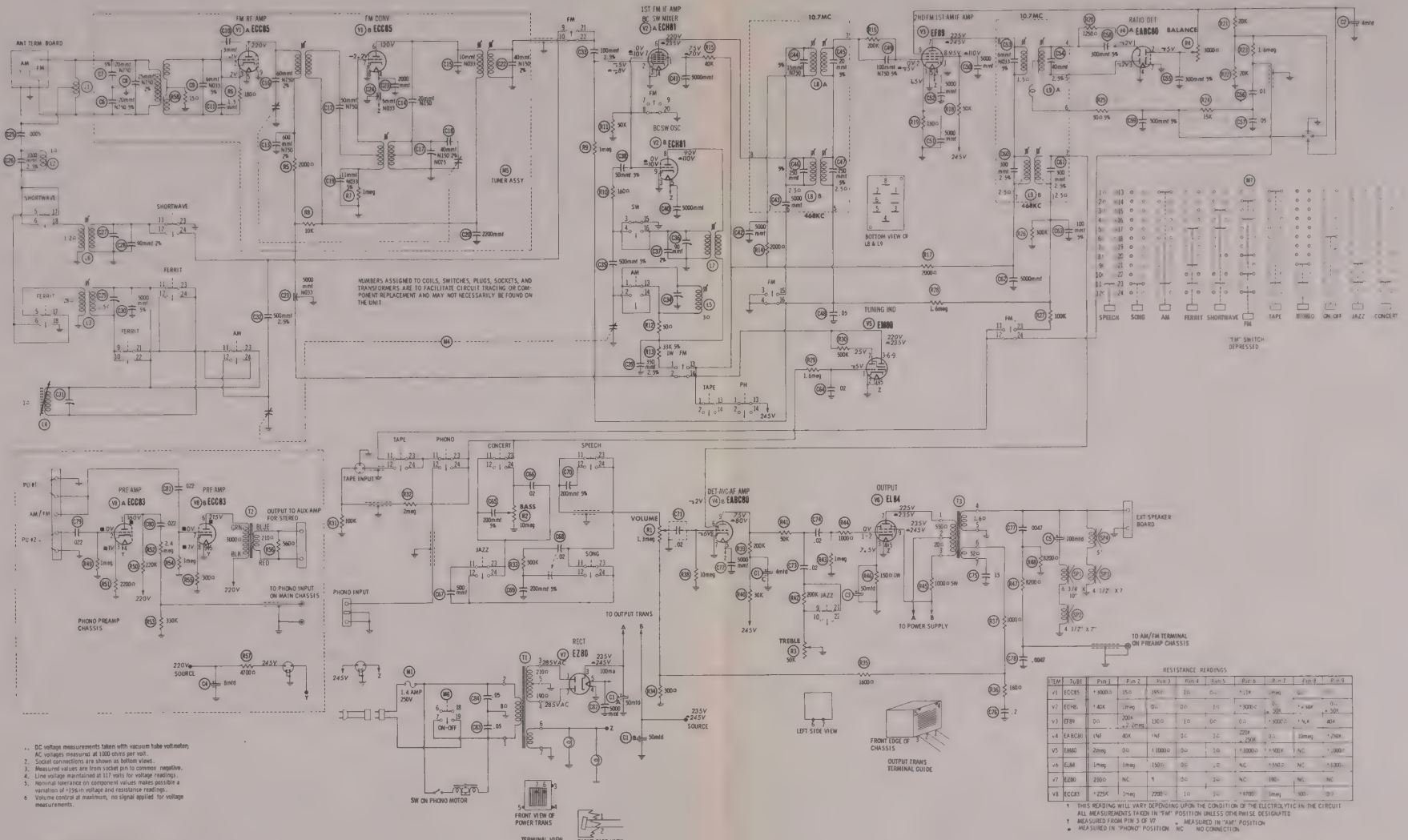
SET 456 FOLDER 11



CHASSIS TOP VIEW— INDUCTOR AND ALIGNMENT IDENTIFICATION



CHASSIS-BOTTOM VIEW- INDUCTOR AND ALIGNMENT IDENTIFICATION



1. DC voltage measurements taken with vacuum tube voltmeter, AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±5% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	ECC85	*1000Ω	150	185Ω	0Ω	0Ω	*1K	0meg	Ω	
V2	ECH81	*40K	1meg	0Ω	0Ω	1Ω	*3000Ω	0 ∞ 20K	*40K	0 ∞ 20K
V3	EF89	0Ω	200K	150Ω	1Ω	0Ω	0Ω	*1000Ω	*1K	40K
V4	EABC80	1MF	40K	1MF	0Ω	1Ω	220K ∞ 250K	0Ω	10meg	*2MΩ
V5	EM80	2meg	0Ω	*1000Ω	0Ω	1Ω	*1000Ω	*1500Ω	NC	*1000Ω
V6	EL84	1meg	1meg	150Ω	0Ω	2Ω	NC	*350Ω	NC	*1300Ω
V7	EZ80	2100Ω	NC	¶	0Ω	2Ω	NC	180Ω	NC	NC
V8	ECC83	*225K	1meg	2200Ω	1Ω	3Ω	*470Ω	1meg	100Ω	0Ω

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT
ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED
† MEASURED FROM PIN 3 OF V7 ▲ MEASURED IN "AM" POSITION
● MEASURED IN "PHONO" POSITION NC NO CONNECTION

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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EMUD MODELS 703, 703ST, 713, 713ST, 723, 723ST

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01mfd	High side to pin 2 (grid) of AM Mixer. Low side to chassis.	468KC (400∿ Mod.)	AM	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	"	High side to AM antenna terminal. Low side to chassis.	"	"	"	"	A5	Adjust for MINIMUM output.
3.	"	"	1620KC	"	"	"	A6	Adjust for maximum output.
4.	"	"	515KC	"	Tuning gang fully closed	"	A7	"
5.	"	"	1400KC	"	1400KC	"	A8	"
6.	"	"	600KC	"	600KC	"	A9	"
7.		Loop	1400KC	AM	1400KC	"	A10	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output. (Depress Ferrit key while adjusting.)
8.		"	600KC	"	600KC	"	A11	"
9.	.01mfd	High side to AM antenna terminal. Low side to chassis.	5.9MC	SW	5.9MC	"	A12, A13	Adjust for maximum output.
10.	"	"	10. MC	"	10. MC	"	A14, A15	"

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
11.	.01mfd	High side to pin 7 (grid) of FM Converter. Low side to chassis.	10.7MC (Unmod.)	FM	Tuning gang fully open	DC probe to point (A). Common to chassis.	A16, A17, A18, A19, A20	Adjust for maximum deflection.
12.	"	"	"	"	"	DC probe to point (B). Common to chassis.	A21	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
11.	.01mfd	High side to pin 7 (grid) of FM Converter. Low side to chassis.	10.7MC (450KC Swp)	FM	Tuning gang fully open	Vert. amp to point (A). Low side to chassis.	A16, A17, A18, A19, A20	Disconnect stabilizing capacitor C2. Adjust for maximum gain and symmetry of response similar to Fig. 1 with markers as shown.
12.	"	"	"	"	"	Vert. amp to point (B). Low side to chassis	A21	Reconnect C2. Adjust to place marker at the center of crossover lines similar to Fig. 2. SLIGHTLY retouch A20 for maximum amplitude and straightness of crossover lines.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
13.	Two 120Ω Carbon Resistors	Across FM antenna terminals with 120Ω in each lead.	88MC (Unmod.)	FM	88MC	DC probe to point (A). Common to chassis.	A22	Adjust for maximum deflection.
14.	"	"	108MC	"	108MC	"	A23	"
15	"	"	98MC	"	98MC	"	A24	"

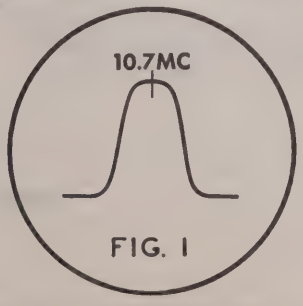


FIG. 1

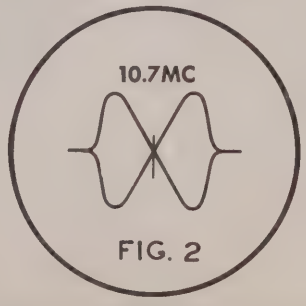
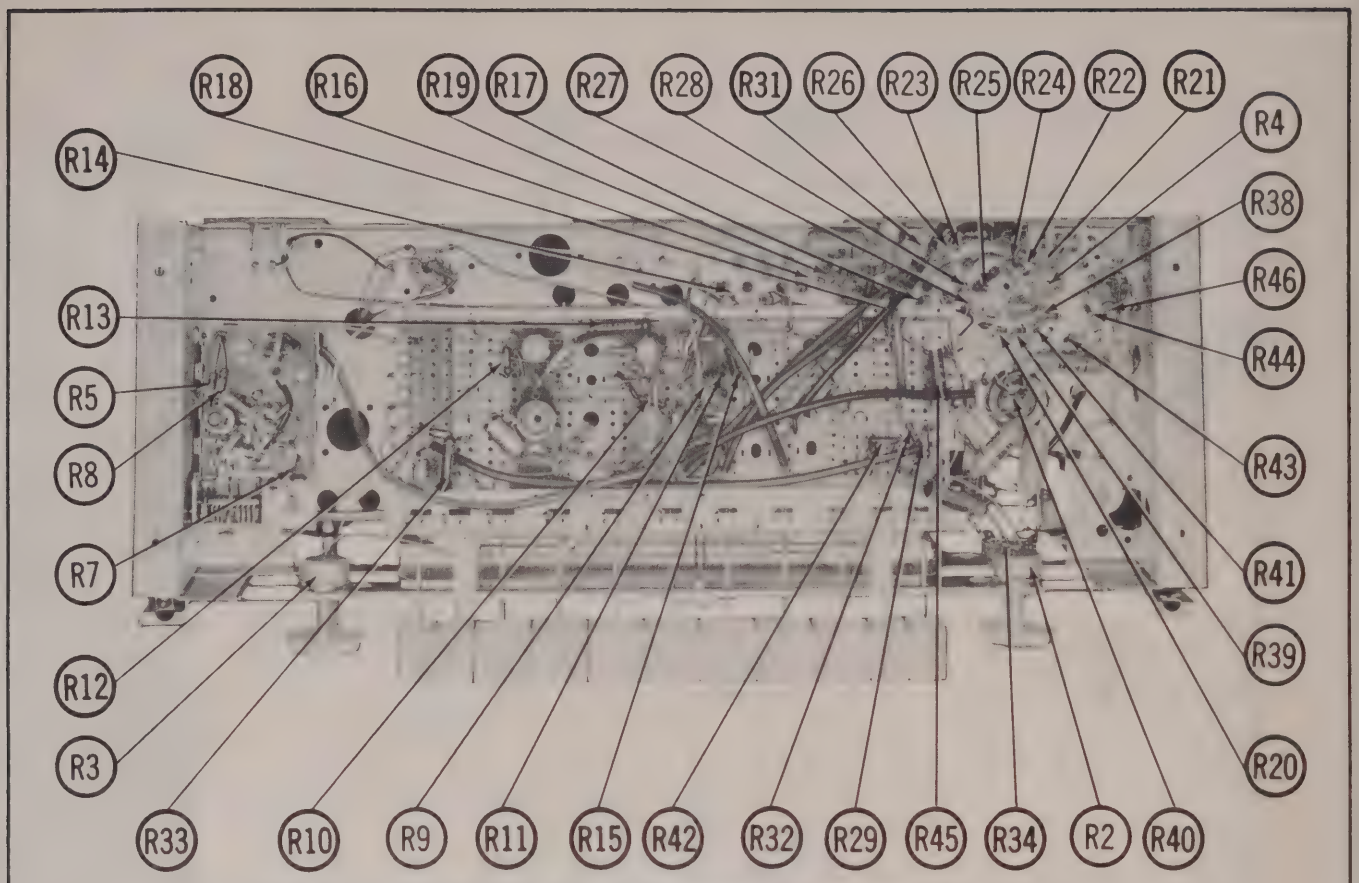
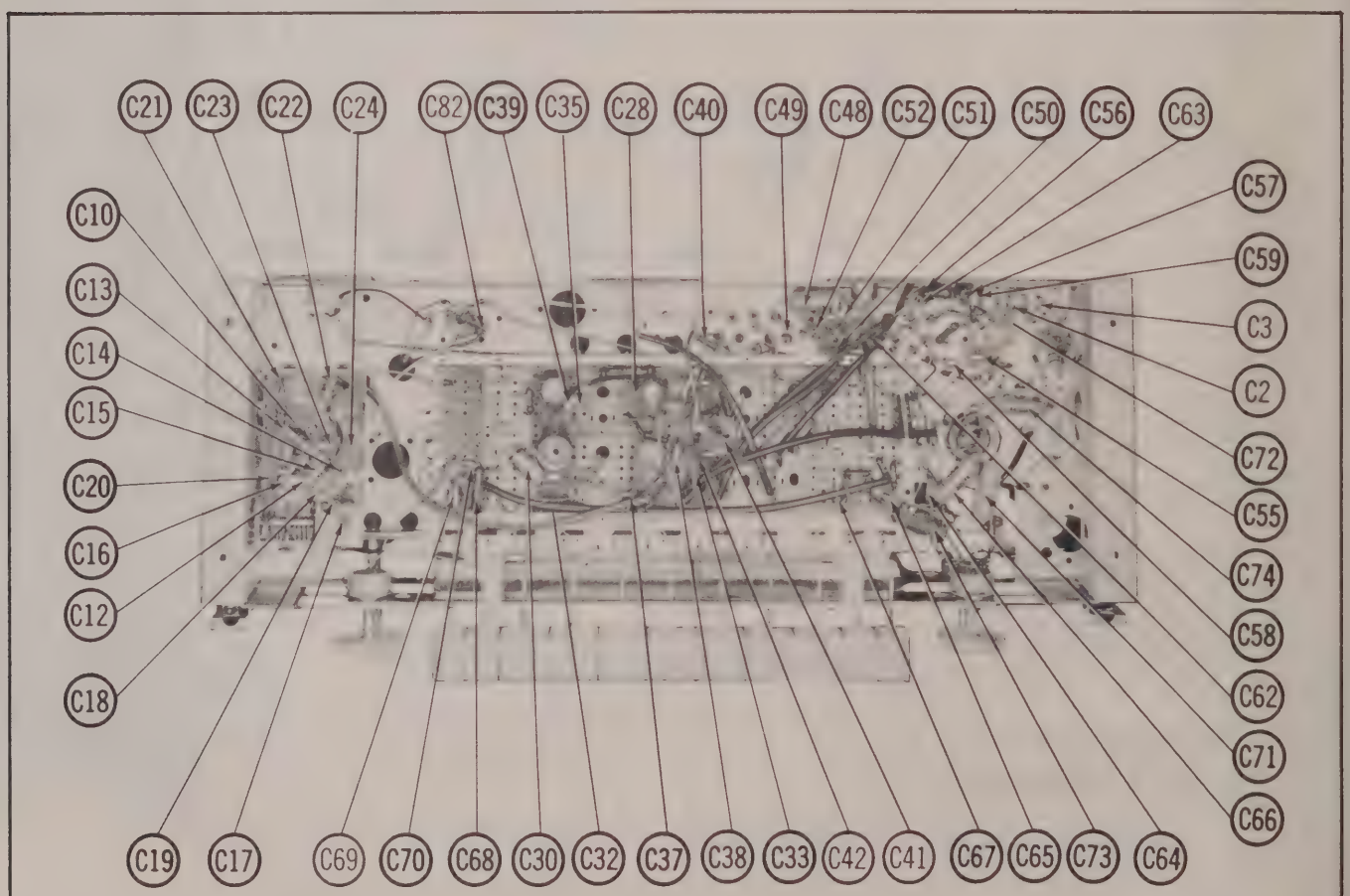


FIG. 2



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION



CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	FM RF Amp. -FM Conv.	ECC85	
V2	1st FM IF Amp. - BC SW Mixer-BC SW Osc.	ECH81	
V3	2nd FM-1st AM IF Amp.	EF89	
V4	Ratio Det. -AM Det. - AVC-AF Amp.	EABC80	

ITEM No.	USE	TYPE	NOTES
V5	Tuning Indicator	EM80	
V6	Output	EL84	
V7	Rectifier	EZ80	
V8	Preamplifier	ECC83	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA EMUD PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	50	350	713-5	PRS350V50	BR5035	TC79	TD-50-450	TVA-1713	
B	50	350		PRS350V50	BR5035	TC79	TD-50-450	TVA-1713	
C	4	385		PRS350V4	BR435	TC60	TD-4-450	TVA-1601	
C2	4	100	713-6	SRE150V5	NLW5-100	TT150X4	TD-4-150	TE-1404	
C3	50	50		PRS50V50	BR505	TC39	TD-50-50	TE-1307	
C4	8	350		PRS350V8	BR835	TC61	TD-8-350	TVA-1603	
C5	100	12	713-7	SRE12V100	BBR100-15	TT15X100	TD-100-15	TE-1160	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	REPLACEMENT DATA EMUD PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C6	20		N750 5%			TCN-20	C10Q2U		5TCU-Q2S 5%*	
C7	20		N750 5%			TCN-20	C10Q2U		5TCU-Q2S 5%*	
C8	25		N750 2%			TCN-25			5TCU-Q25S 2%*	Note 1
C9	6		N033 5%							
C10	3				NPO-DI 3	DTZ-3R3	C10V3C	CNO-533	5TCCB-V33	
C11	1.5					DTZ-1R5	C10V15C	ZT5515	5TCCB-V15	
C12	50		N750		N750-SI 50	TCN-50	C10Q5U		5TCU-Q50S	
C13	600		N750 2%							
C14	20		N150							
C15	10		N033							
C16	60		N750 2%						5TCU-Q60S 2%*	
C17			N075							
C18	40		N150 2%							
C19	11		N033 5%							
C20	2200				SI 2200	D6-222	BYA10D22	UC-5222	5HK-D22	
C21	5000		N033							
C22	40		N150 2%							
C23	2000				BPD-002	DD-202	BYA10D2	B-220	5HK-D2	
C24	5		N033							
C25	.0005	500			P688N-0005	D6-501	CUB6T5	B-350	6TM-T5	
C26	1000		2.5%		1469-001 1%		1R5D1 2%	MCE255	MS-21	
C27										
C28	90		2%						5GA-Q90S 2%*	
C29										
C30	5000		5%		1464-005		1DR5D5	MCE465	MS-25	
C31										
C32	500		2.5%		1469-0005 1%		22R5T5 2%	MCE245	MS-35S 2.5%*	
C33	100		2.5%		1469-0001 1%		22R5T1 2%	MCE235	MS-310S 2.5%*	
C34										
C35	500		5%		1469-0005		22R5T5	MCE245	MS-35	
C36										
C37	90		2%							
C38	50		5%		1469-00005	TCZ-50	22R5Q5	MCE225	MS-45S*	
C39	350		2.5%		1469-00035 1%		22R5T36 1%		MS-235S2.5%*	
C40	5000				SI 5000	D6-502	BYA10D5	UC-525	5HK-D5	
C41	5000				SI 5000	D6-502	BYA10D5	UC-525	5HK-D5	
C42	5000				SI 5000	D6-502	BYA10D5	UC-525	5HK-D5	
C43	5000				SI 5000	D6-502	BYA10D5	UC-525	5HK-D5	
C44	15		N750 5%			TCN-15	C10Q15U	UC-5415	5TCU-Q15S 5%*	
C45	20		5%			TCZ-20	C10Q2C		5TCC-Q2S 5%*	
C46	250		5%		1464-00025		22R5T25	MCE240	MS-325	
C47	250		5%		1464-00025		22R5T25	MCE240	MS-325	

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	REPLACEMENT DATA EMUD PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C48	.05	500			P688N-05	DF-503	CUB6S5	GEM-615	6TM-S5	
C49	100		N750 5%			TCN-100	C10T1U	CN7-310	5TCU-T1S 5%*	
C50	5000				SI 5000	D6-502	BYA10D5	UC-525	5HK-D5	
C51	5000				SI 5000	D6-502	BYA10D5	UC-525	5HK-D5	
C52	5000				SI 5000	D6-502	BYA10D5	UC-525	5HK-D5	
C53	6		N033 5%							
C54	40		2.5%		1464-00004 1%	TCZ-39	22R5Q4 2%	MCE223	MS-44S 2.5%*	
C55	300		5%		1464-0003	TCZ-300	22R5T3	MCE241	MS-33	
C56	.01	500			P688N-01	P688N-01	CUB5S1	GEM-611	6TM-S1	
C57	.05	500			P688N-05	P688N-05	CUB5S5	GEM-615	6TM-S5	
C58	300		5%		1464-0003	TCZ-300	22R5T3	MCE241	MS-33	
C59	300		5%		1464-0003	TCZ-300	22R5T3	MCE241	MS-33	
C60	300		2.5%		1464-0003 1%		22R5T3 2%	MCE241	MS-33S 2.5%*	
C61	300		2.5%		1464-0003 1%		22R5T3 2%	MCE241	MS-33S 2.5%*	
C62	5000				SI 5000	D6-502	BYA10D5	UC-525	5HK-D5	
C63	100		5%		1464-0001	TCZ-100	22R5T1	MCE235	MS-31	
C64	.02	500			P688N-02	DD-203	CUB6S2	GEM-612	6TM-S2	
C65	200		5%		1464-0002	TCZ-200	22R5T2	MCE237	MS-32	
C66	.02	500			P688N-02	DD-203	CUB6S2	GEM-612	6TM-S2	
C67	500				1464-005	DD-501	22R5T5	MCE245	MS-35	
C68	.02	500			P688N-02	DD-203	CUB6S2	GEM-612	6TM-S2	
C69	200		5%		1464-002	TCZ-201	22R5T2	MCE237	MS-32	
C70	200		5%		1464-002	TCZ-201	22R5T2	MCE237	MS-32	
C71	.02	500			P6123Z-02		TWC6S22		118P22306S2	Note 2
C72	5000				SI 5000	D6-502	BYA10D5	UC-525	5HK-D5	
C73	.02	500			P688N-02	DD-203	CUB6S2	GEM-612	6TM-S2	
C74	.02	500			P688N-02	DD-203	CUB6S2	GEM-612	6TM-S2	
C75	.15	250			P488N-15		CUB4P15	GEM-4015	4TM-P15	
C76	.2	250			P488N-2		CUB4P2	GEM-402	4TM-P2	
C77	.0047	250			P488N-0047	D6-472	CUB4D47	GEM-4247	4TM-D47	
C78	.0047	250			P488N-0047	D6-472	CUB4D47	GEM-4247	4TM-D47	
C79	.022	250			P488N-022	DD-203	CUB4S22	GEM-4122	4TM-S22	
C80	.022	250			P488N-022	DD-203	CUB4S22	GEM-4122	4TM-S22	
C81	.022	250			P488N-022	DD-203	CUB4S22	GEM-4122	4TM-S22	
C82	5000				SI 5000	D6-502	BYA10D5	UC-525	5HK-D5	
C83	.05	500			P688N-05	DF-503	CUB6S5	GEM-615	6TM-S5	
C84	.05	500			P688N-05	DF-503	CUB6S5	GEM-615	6TM-S5	

* Not normally in distributor's stock. Available thru distributor on order to manufacturer.
Note 1. Some versions may use 40mmf in this application.
Note 2. Ground Metal Case.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA EMUD PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1	1.3meg	1/2	713-8					Volume
R2	10meg	1/2	713-9					Bass
R3	50K	1/2	713-10					Treble
R4	3000Ω	1/2						Balance

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	EMUD PART No.	NOTES
R5	2000Ω			
R6	180Ω			
R7	1meg			
R8	10K			
R9	1meg			
R10	160Ω			
R11	50K			
R12	50Ω			
R13	33K 5%	1		

ITEM No.	RATING OHMS	RATING WATT	EMUD PART No.	NOTES
R14	2000Ω			
R15	40K			
R16	200K			
R17	2000Ω			
R18	50K			
R19	130Ω			
R20	1250Ω			
R21	20K			
R22	20K			

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS (cont)

ITEM No.	RATING OHMS	RATING WATT	EMUD PART No.	NOTES
R23	1.6meg			
R24	15K			
R25	50Ω 5%			
R26	300K			
R27	100K			
R28	1.6meg			
R29	1.6meg			
R30	500K			
R31	100K			
R32	2meg			
R33	500K			
R34	300Ω			
R35	1600Ω			
R36	160Ω			
R37	1000Ω			
R38	10meg			
R39	200K			
R40	30K			

ITEM No.	RATING OHMS	RATING WATT	EMUD PART No.	NOTES
R41	50K			
R42	200K			
R43	1meg			
R44	1000Ω			
R45	1000Ω	5		
R46	150Ω	1		
R47	8200Ω			
R48	8200Ω			
R49	1meg			
R50	220K			
R51	2200Ω			
R52	2.4meg			
R53	330K			
R54	1meg			
R55	300Ω			
R56	560Ω			
R57	4700Ω			
R58	15Ω			

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA EMUD PART No.	Gramer PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	FM Ant. Coil							
L2	AM Ant. Coil							
L3	AM Ant. Trans.							
L4	Loopstick	713-17						
L5	BC Osc. Coil							
L6	SW Ant. Trans.							
L7	SW Osc. Coil							
L8A	1st FM IF Trans.	713-14						
B	1st AM IF Trans.							
L9A	Ratio Detector	713-15						
B	2nd AM IF Trans.							

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA EMUD PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ .68A	570 VCT @ .100A	6.3V @ 3.9A	713-12						

TRANSFORMER (DRIVER)

ITEM No.	TURNS RATIO PRI.	TURNS RATIO SEC.	REPLACEMENT DATA EMUD PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	5.8	1	BV70734						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC. 1	REPLACEMENT DATA EMUD PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T3	7400Ω Tap @ 3%	590Ω SEC. 2	713-13							
		10Ω								

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	REPLACEMENT DATA EMUD PART No.	QUAM PART No.	NOTES
SP1	6 3/4"x 10"	PM	4-5Ω	713-3		
SP2	4½" x 7"	PM	4-5Ω	713-2		
SP3	4½" x 7"	PM	4-5Ω	713-2		
SP4	5"	PM	4-5Ω	713-4		

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA EMUD PART No. FUSE	EMUD PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M1		1.4A 250V	713-20					

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA EMUD PART No.	ASTATIC PART No. CARTRIDGE	ASTATIC PART No. NEEDLE	ELECTRO-VOICE PART No. CARTRIDGE	ELECTRO-VOICE PART No. NEEDLE	JENSEN PART No. CARTRIDGE	JENSEN PART No. NEEDLE	REMARKS
M2							CRA-55 or CRA-55D and CRA-55X or CRA-55XD	

PARTS LIST AND DESCRIPTIONS (Continued)

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	EMUD PART No.	JENSEN PART No.	WALCO PART No.	
M3	TC8G (78 RPM)	CRA-55* or CRA-55D ♦		* Metal † Jewel ♦ Diamond
	TC8RG (LP)	CRA-55X † or CRA-55XD ♦		

MISCELLANEOUS

ITEM No.	PART NAME	EMUD PART No.	NOTES
M4	Tuning Cap.	713-30	2 Gang
M5	Tuner	713-16	FM (Complete)
M6	Switch Mech.	713-33	Off-On
M7	Switch	713-11	Function Complete

CABINETS & CABINET PARTS

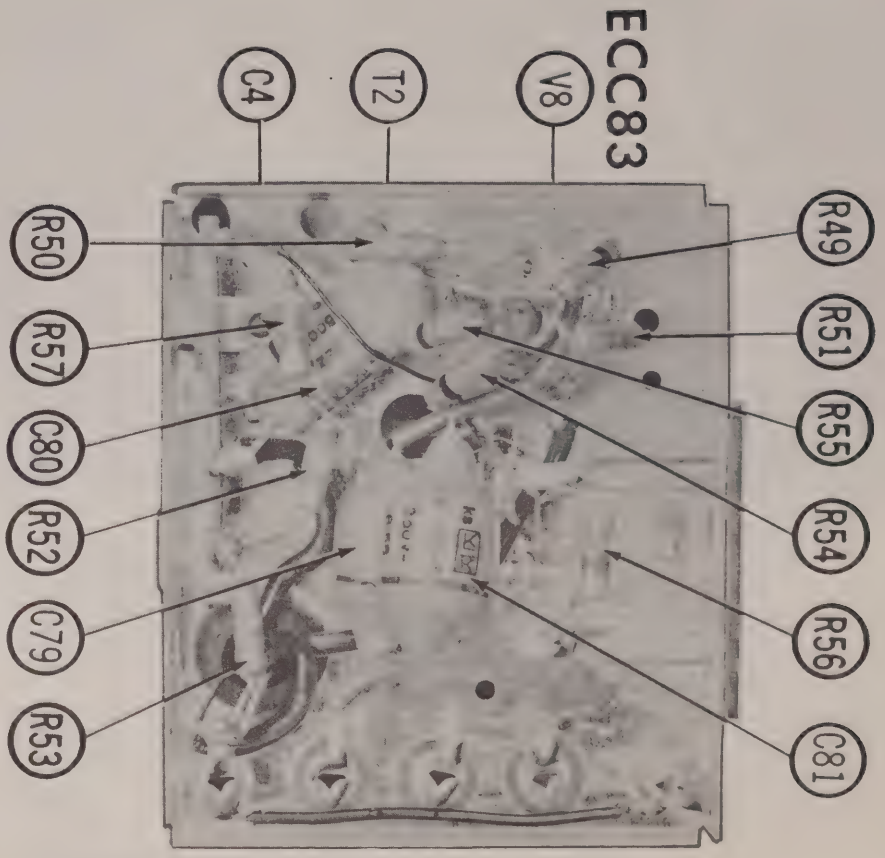
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	713-25	Tuning, FM & AM
Knob	713-26	Volume
Knob	713-27	Treble & Bass
Dial Glass	713-1	

WIRING DATA

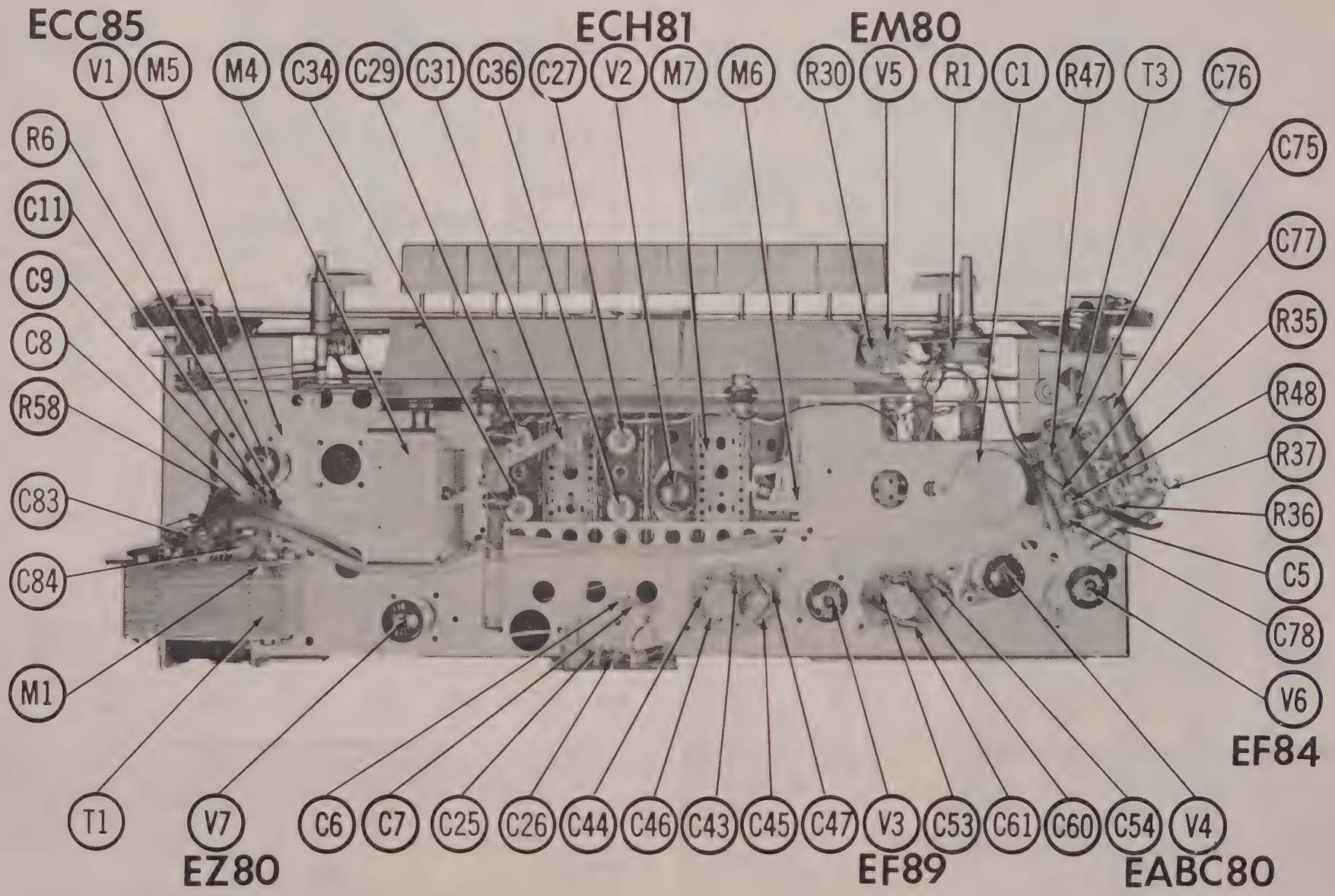
General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

PRE-AMP CHASSIS



EMUD MODELS 703, 703ST, 713, 713ST, 723, 723ST

FOLDER 11



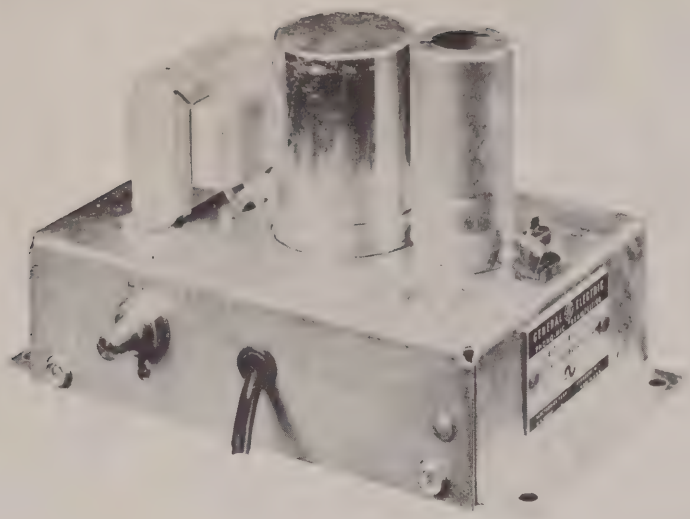
CHASSIS TOP VIEW

PHOTOFACT* Folder

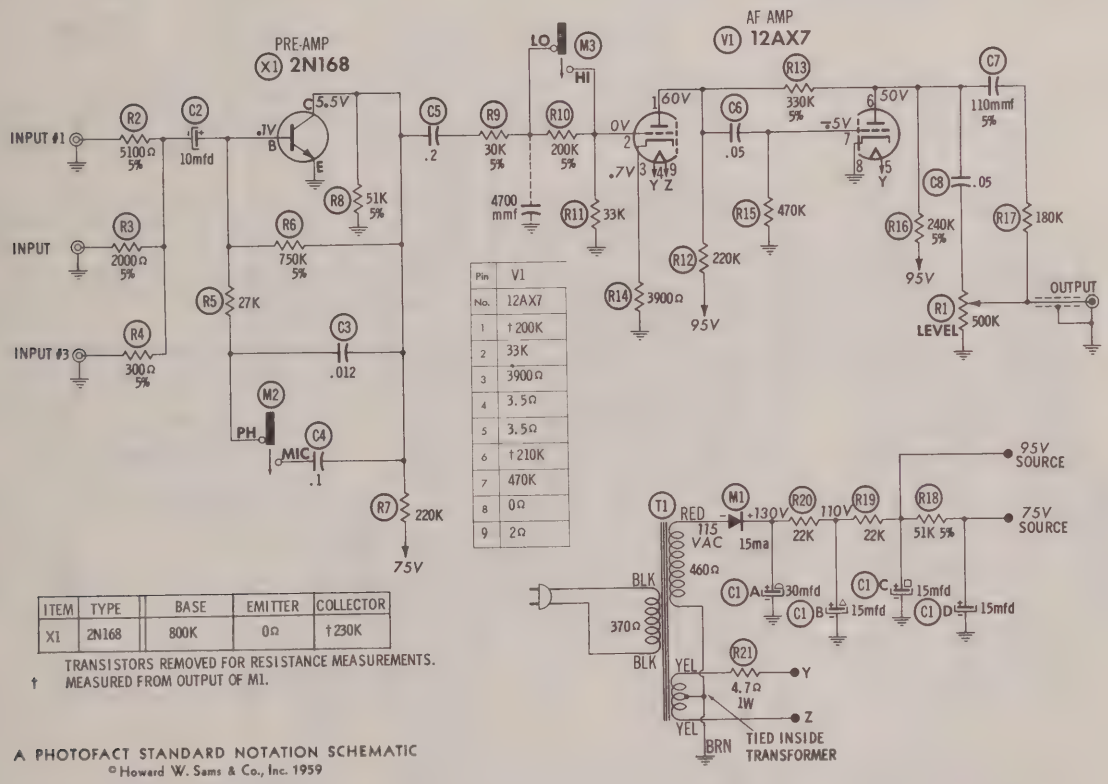
EIA MEMBER

GENERAL ELECTRIC MODEL A1-203

GENERAL ELECTRIC
MODEL A1-203



TRADE NAME	General Electric Model A1-203
MANUFACTURER	General Electric Co., Specialty Electronic Components Dept., W. Genesee St., Auburn, N. Y.
TYPE SET	AC Operated One Transistor, One Tube Audio Preamplifier
POWER SUPPLY	105-125 Volts AC, 60 Cycles RATING .09 Watts, .1 Amp. @ 117 Volts AC



Pin No.	V1
1	†200K
2	33K
3	3900Ω
4	3.5Ω
5	3.5Ω
6	†210K
7	470K
8	0Ω
9	2Ω

ITEM	TYPE	BASE	EMITTER	COLLECTOR
X1	2N168	800K	0Ω	†230K

TRANSISTORS REMOVED FOR RESISTANCE MEASUREMENTS.
† MEASURED FROM OUTPUT OF M1.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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GENERAL ELECTRIC
MODEL A1-203

SET 456 FOLDER 12

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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JW159

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amplifier	12AX7	

ITEM No.	USE	TYPE	NOTES

TRANSISTORS

ITEM No.	ORIG. TYPE	USE	REPLACEMENT DATA				NOTES
			CBS PART No.	RCA PART No.	RAYTHEON PART No.	SYLVANIA PART No.	
X1	2N168	Preamplifier					NPN

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	G. E. PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	
C1A	▲30	150	ECE-231	AFH4-15	D0140	FP444.4	TMQ-13	TVL-4766	
B	▲15	150							
C	■15	150							
D	15	150							
C2	10	15	ECE-230	PRS25V10	BBR10-25	TC22	TD-10-25	TVA-1204	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	G. E. PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	.012	200			P288N-01	DD-103	CUB4S1	GTM-211	4TM-S1	
C4	.1	200			P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C5	.2	200			P288N-2		CUB2P22	GEM-2022	2TM-P22	
C6	.05	200			P288N-05	DF-503	CUB2S5	GTM-4147	2TM-S5	
C7	110		5%	ECG-017	1464-110	TCZ-110	22R5T11		MS-311	
C8	.05	400			P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	G. E. PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K	½	ERC-357	B-60	A47-500K-Z	Q13-133	U48	Level
B	Shaft			Not Req.	RS-2	Not Req.	Not Req.	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

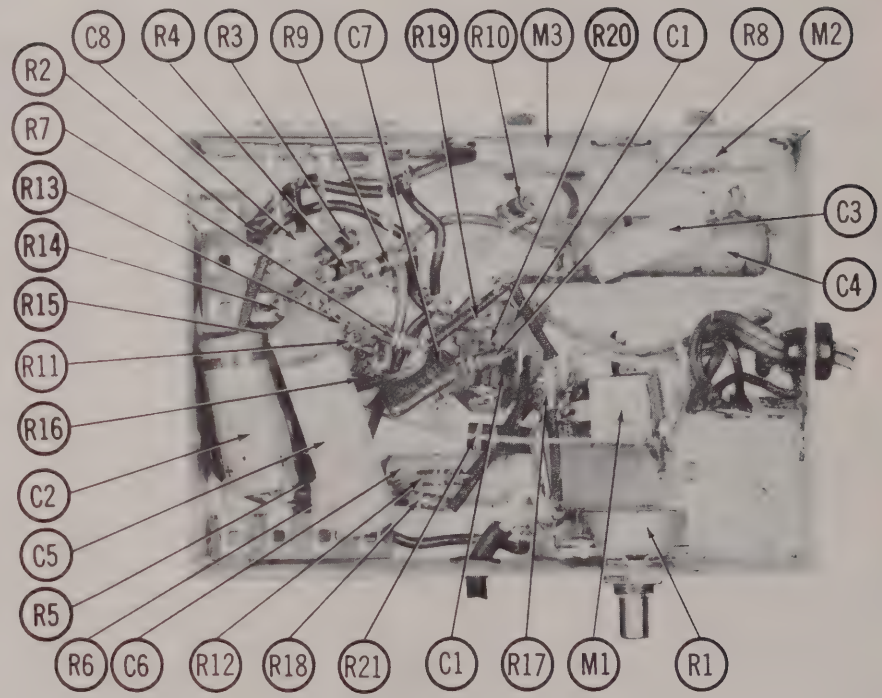
ITEM No.	RATING		G. E. PART No.	NOTES
	OHMS	WATT		
R2	5100Ω 5%			
R3	2000Ω 5%			
R4	300Ω 5%			
R5	27K			
R6	750K 5%			
R7	220K			
R8	51K 5%			
R9	30K 5%			
R10	200K 5%			
R11	33K			

ITEM No.	RATING		G. E. PART No.	NOTES
	OHMS	WATT		
R12	220K			
R13	330K 5%			
R14	3900Ω			
R15	470K			
R16	240K 5%			
R17	180K			
R18	51K 5%			
R19	22K			
R20	22K			
R21	4.7Ω	1		

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	G. E. PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V Ⓐ .1A	115V Ⓐ .001A	6.3 VCT Ⓐ .3A	ETP-307						

CHASSIS BOTTOM VIEW



RECTIFIERS

ITEM No.	RATING	REPLACEMENT DATA					NOTES
	CURRENT (Measured)	G. E. PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	SYLVANIA PART No.	
M1	.015	EER-011①	1159①	D5410①	Model 10②		① Selenium Type ② Silicon Type

MISCELLANEOUS

ITEM No.	PART NAME	G. E. PART No.	NOTES
M2	Switch	ESS-010	Phono-Microphone (SPDT, Slide Type)
M3	Switch	ESS-010	Gain (Lo-Hi) (SPDT, Slide Type)

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

LESA
MODEL CD2/21

LESA
MODEL CD2/21

LESA
MODEL CD2/21

GENERAL INFORMATION

Lesa CD2/21 record changers play a stack of records automatically in sequence, and shut off after the last record has been played. In addition, the records can be played manually in any of the four speeds.

Any assortment of 7-, 10-, or 12-inch records -- provided they are all the same speed -- can be intermixed in any order.

A stack of 10-inch records with a 1 1/2-inch center hole can also be played and automatically changed when the 45-rpm automatic spindle (available as an accessory) is used.

After the last record has been played, the pickup arm returns to the rest post and automatically shuts off the changer.

The Lesa CD2/21 operates on 110 volts, 60 cycles AC.

Manufactured by:	Imported by:
Lesa -- S.p.A.	Lesa of America
Via Bergamo, 21	11 West 42nd Street
Milano, Italy	New York, N.Y.

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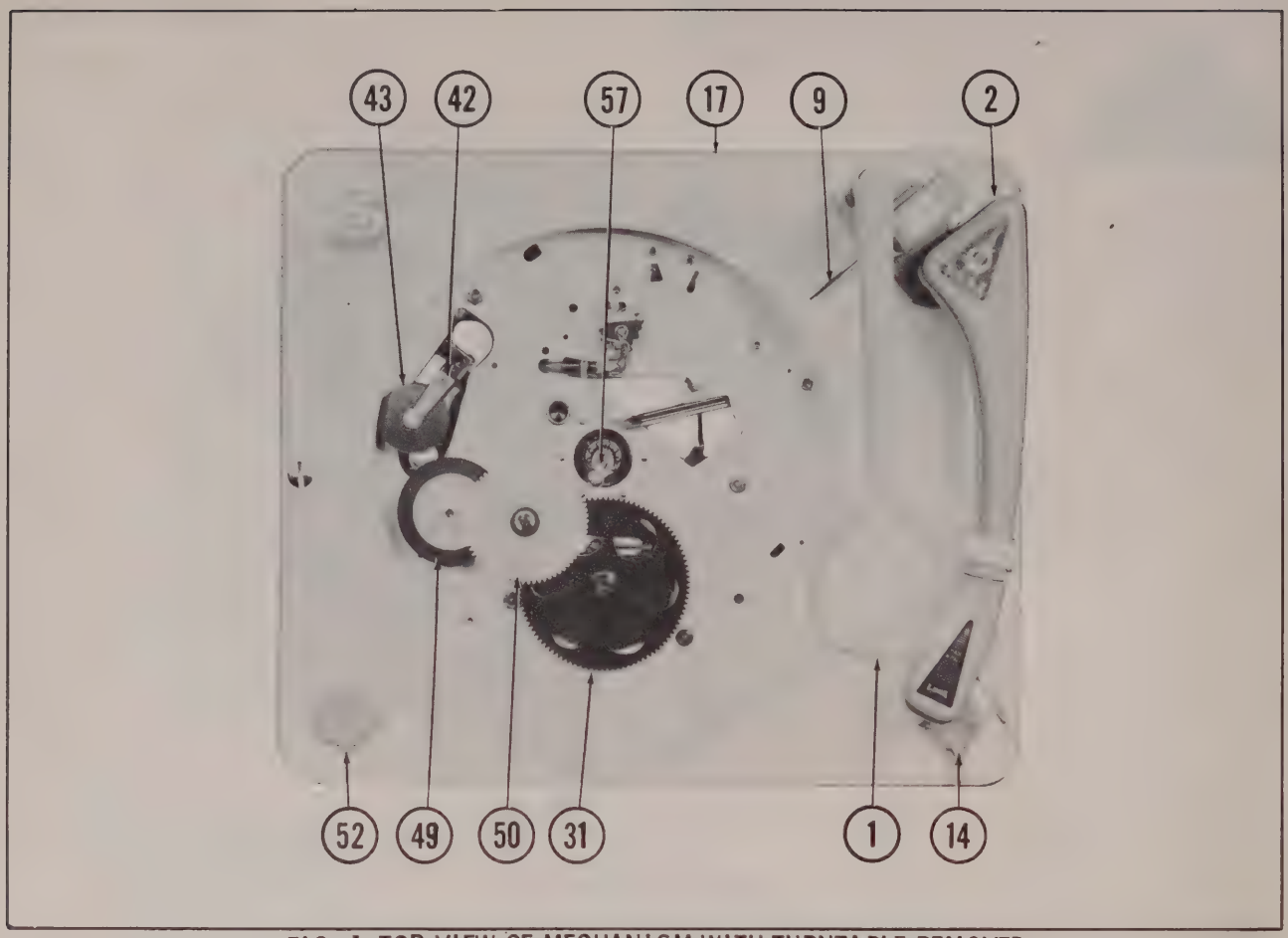


FIG. 1 TOP VIEW OF MECHANISM WITH TURNTABLE REMOVED

FUNCTIONS OF CONTROLS

Stop-On-Reject

This control turns the changer on and off, and rejects a record. To start the changer, turn the knob clockwise to the On-Rej. position and hold for a few seconds. To stop the changer, turn the knob until the pointer labeled Stop is in line with the mark on the baseplate. To reject a record, turn the control to the Rej. position and release.

Speed Change

Turning this control selects the desired speed for the record to be played.

OPERATING INSTRUCTIONS

Loading

Place no more than eight records of any size on the spindle, and gently lower them to the spindle shelf. The changer will automatically position the tone arm for the different sizes of records.

NOTE: Intermixed records must have the same speed and groove.

Starting

Before starting the changer, turn the Speed control to the speed corresponding to the records to be played, and release the safety latch on the tone arm. To start the changer, turn the Stop-On-Rej. control to the On-Rej. position and hold for a few seconds. The changer will operate automatically until the last record has been played. The tone arm will then return to its rest and automatically switch off the supply to the motor.

Rejecting

To reject a record at any time, turn the Stop-On-Rej. knob to the Rej. position and release.

To Use as a Manual Record Player

1. Lift the control arm and swing it outward to the right.
2. Place a record on the turntable.

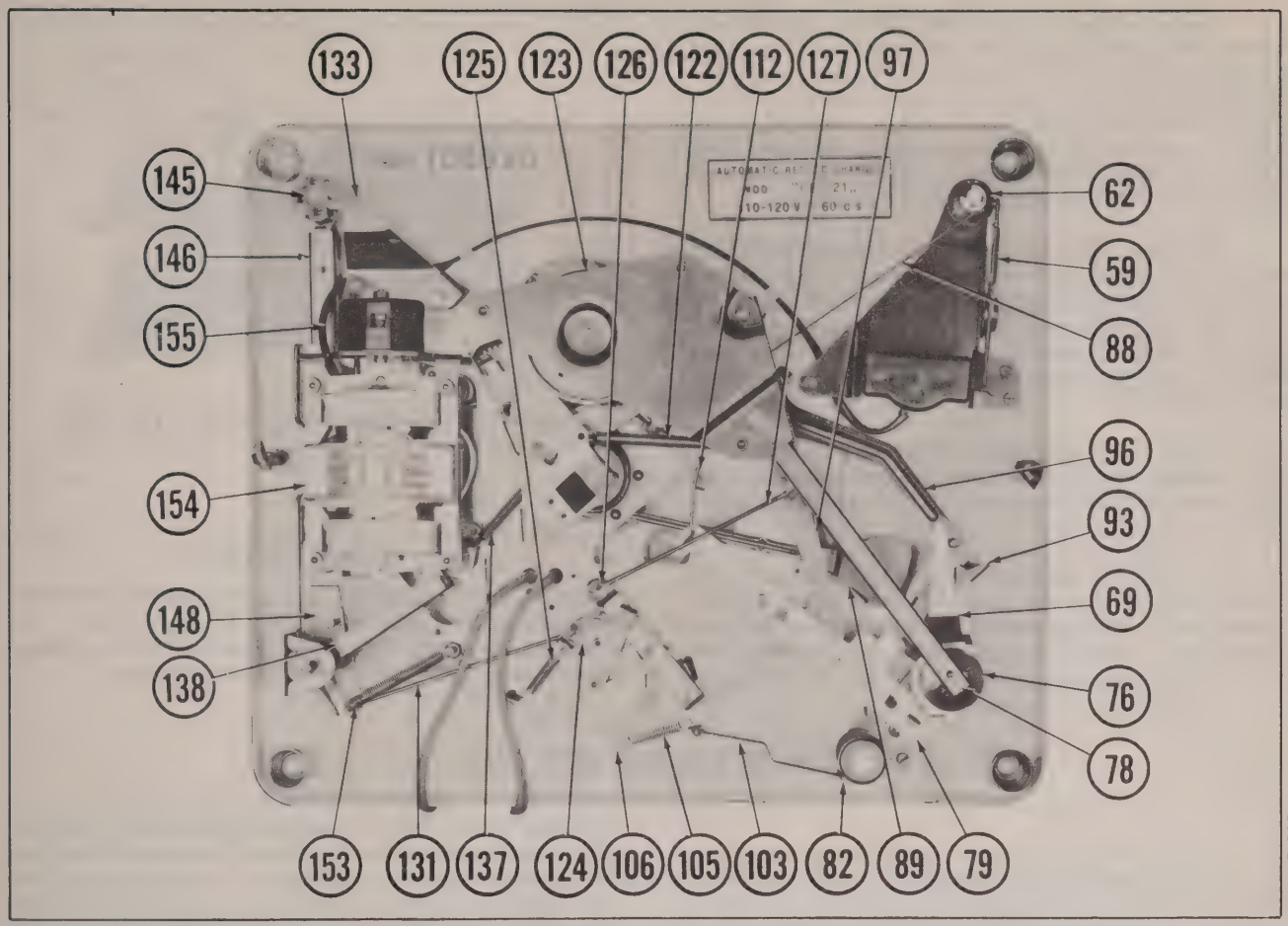


FIG. 2 BOTTOM VIEW OF MECHAMISM

3. Turn the Stop-On-Rej. control to the On position.

4. Place the tone arm on the record.

5. When the record has finished playing, the tone arm will return to its rest position and automatically shut off the changer.

To Play Records

Place not more than eight records of the same speed on the spindle. Turn the Speed Selector control to the corresponding speed. The record changer will play the records automatically and shut off after the last record has been played.

CHANGE CYCLE

The change cycle is started by the faster inward movement of the tone arm as the needle enters the lead-out groove at the end of the record.

The tone arm assembly and lever (68) are held together by friction. This friction rotates auto stop lever (89) until it contacts spring (21). Spring (21) is secured to the turntable and revolves with it. The inward movement of the tone arm, as it tracks along the groove of the record, is not fast enough to trip the mechanism. The reason is that spring (21) pushes lever (89) backward far enough for lever (68) to slip on the clutch.

The lead-out groove advances the tone arm rapidly toward the spindle. Spring (21) fails to push lever (89) backward because of the faster speed of the tone arm. Instead, spring (21) engages push lever (89) and actuates automatic control arm (107), which is turned by pull rod (88). The turning of automatic control arm (107) causes control wheel (43) to butt against the motor and to cycle the changer by means of gears (50) and (31).

As cams (109), (111), and (115) rotate, cam (115) actuates lever (78). Lever (78) pushes rod (73) upward. This raises the tone arm from the record. At the same time, lever (97) is actuated by cam (111), and swings the tone arm outward.

As cam (115) continues to rotate, record dropping lever (114) is pushed backward by a stud on cam (115). This action pulls the operating bar in the spindle inward, and a record drops onto the turntable.

As cam (109) rotates, lever (127) is actuated, and causes slide arm (79) to slide backward and to actuate finger (9). When a 7-inch record is dropped, finger (9) does not move. However, when a 10- or 12-inch record is dropped, finger (9) causes lever (11) to revolve around its boss and to actuate slide arm (79). This action presets the correct step against swing arm (96) for the inward movement of the tone arm.

As cams (109), (111), and (115) continue to rotate, swing arm (96) swings inward because of the tension applied by spring (116) against arm (69), and moves the tone arm over the record. At the same time, lever (78) rides down the detent on cam (115) and allows push rod (73) to set the needle down in the lead-in groove of the record.

The cams continue to rotate until the tab on arm (107) engages the locking arm on locking disc (36). This action locks the changer in the out-of-cycle position.

As soon as the last record has fallen, record balancing arm (1) drops below the shelf on the spindle. The record balancing arm shaft has two constrictions. When lever (82) swings into either constriction, hook arm (93) swings inward and locks lever (96). As a result, the tone arm will not swing inward, but will set down on its rest (16) and shut off the changer. At the same time, trip lever (104) of pawl (126) disengages rubber idler wheel (43) and shorts the pickup.

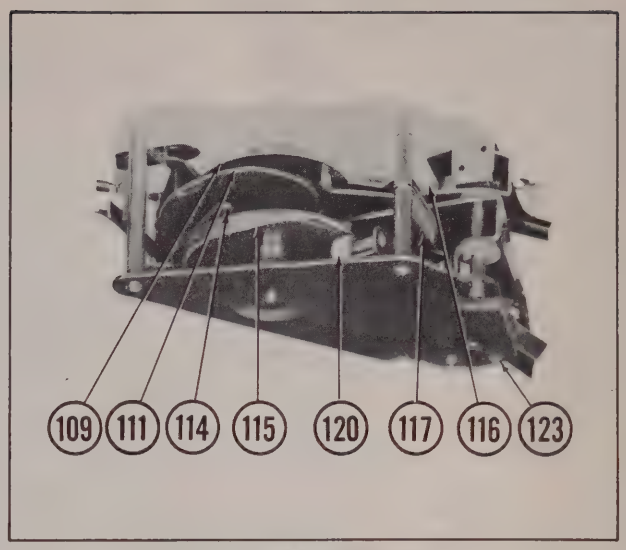


FIG. 3 CAM ASSEMBLY

TONE ARM HEIGHT ADJUSTMENT

The tone arm height is correct when the tip of the needle rises 5/64 inches above a stack of records 7/8 inch high. To adjust the height of the tone arm, turn hex head screw, which is under the tone arm and near the hinge. When properly adjusted, the tone arm should not touch the bottom record on the spindle. Nor should the tone arm touch the base plate if dropped past the edge of the record. Instead, it should stay halfway between the turntable and the base plate.

TROUBLE CHART

Symptom	Cause	Remedy
Wow	1. Turntable distorted, or foreign matter on inside of rim.	1. Replace turntable, or remove foreign matter from rim.
	2. Rubber mat not in place.	2. Rubber mat must be in place to prevent wobbling.
	3. Idler wheel (43) out of round.	3. Replace idler wheel (43).
	4. Center boss defective.	4. Replace center boss, so that the vertical travel will not exceed .004".
Slow or noisy turntable rotation.	1. Ball bearing (23) and washer incorrectly assembled.	1. Assemble ball bearing (23) and washer so that the turntable will have a small amount of end play when the circlip is in place.
	2. Defective ball bearing (23) damaged thrust-bearing washer, or ball wedged in thrust-bearing race.	2. Replace ball bearing (23) or thrust-bearing washer.
Background rumble.	1. Ball bearing (23) dirty, dry, or damaged.	1. Clean and lubricate ball bearing if dirty or dry. Replace if damaged.

TROUBLE CHART (CON'T.)

Symptom	Cause	Remedy
Low thumping sound.	1. Idler wheel (43) distorted.	1. Replace idler wheel (43).
	2. Rubber rim chipped or worn.	2. Replace rubber rim.
	3. Foreign matter adhering to rim.	3. Clean foreign matter from rim.
Turntable idler drive wheel rotates too slowly.	1. Spindle distorted.	1. Straighten or replace spindle.
	2. Ball opposite spring (42) dry.	2. Clean and lubricate the ball.
Incorrect speed.	1. End of arm (146) not properly bent.	1. Adjust arm (146) so that the top rim of idler wheel (43) is flush with the larger diameter surface of motor pulley (45).
	2. Arm (51) distorted.	2. Replace arm (51), so that idler drive wheel (43) will be at the correct level with respect to each driving diameter of the motor pulley.
Changer runs at 45 rpm when a stack of 78 rpm records is loaded. (Speed switch at 78 rpm position).	1. Spring (42) has lost its tension.	1. Replace spring (42).
	2. Arm (51) distorted.	2. Straighten or replace arm (51).
Motor runs slowly or noisily.	1. Foreign matter between rotor and stator.	1. Clean between the rotor and stator to remove the foreign matter.
	2. Rotor not centered in stator.	2. Loosen the clamps, insert two 1-inch wide by .012-inch thick steel shims between the rotor and stator, tighten the clamps, and remove the shims.
Wow that varies with the motor speed.	1. Motor spindle bent.	1. Straighten the spindle or replace motor (154).
	2. Enlarged bore in the pulley.	2. Replace motor pulley (45). The motor pulley driving surface must be free from flats or other irregularities.
Turntable rotates too slowly.	1. Motor pulley (45) locking screw loose.	1. Tighten the locking screw and check for correct height with respect to idler wheel (43) and automatic control wheel (49).
Turntable does not rotate.	1. Idler swivel arms (138 and 44) distorted.	1. Straighten or replace.
	2. Spring (150) has lost its tension.	2. Replace spring (150).
	3. Arm (148) fails to return to its outward rest position.	3. Spring (151) broken or has lost its tension, and must be replaced.

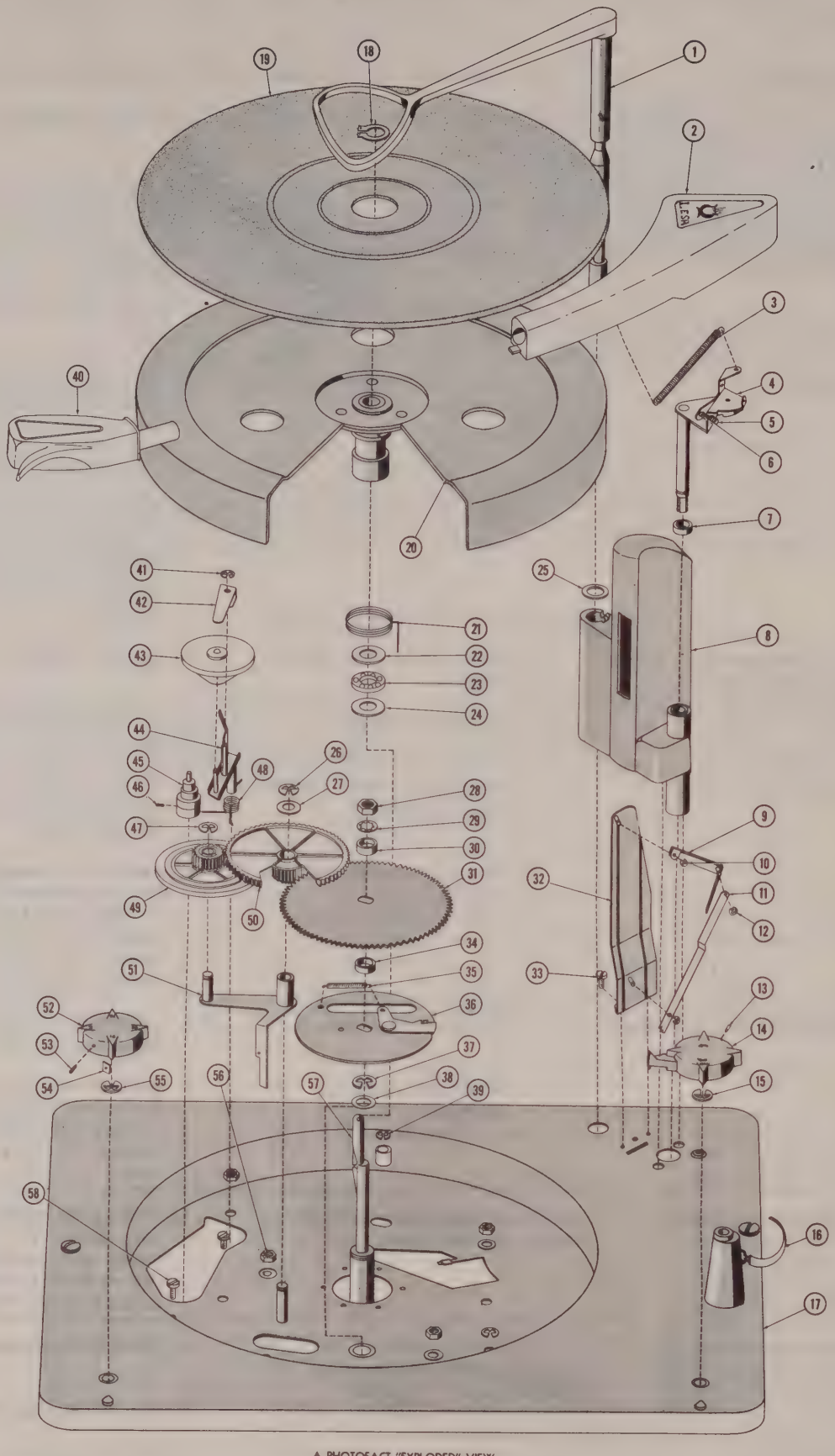


FIG. 4A EXPLODED VIEW OF PARTS ABOVE BASEPLATE

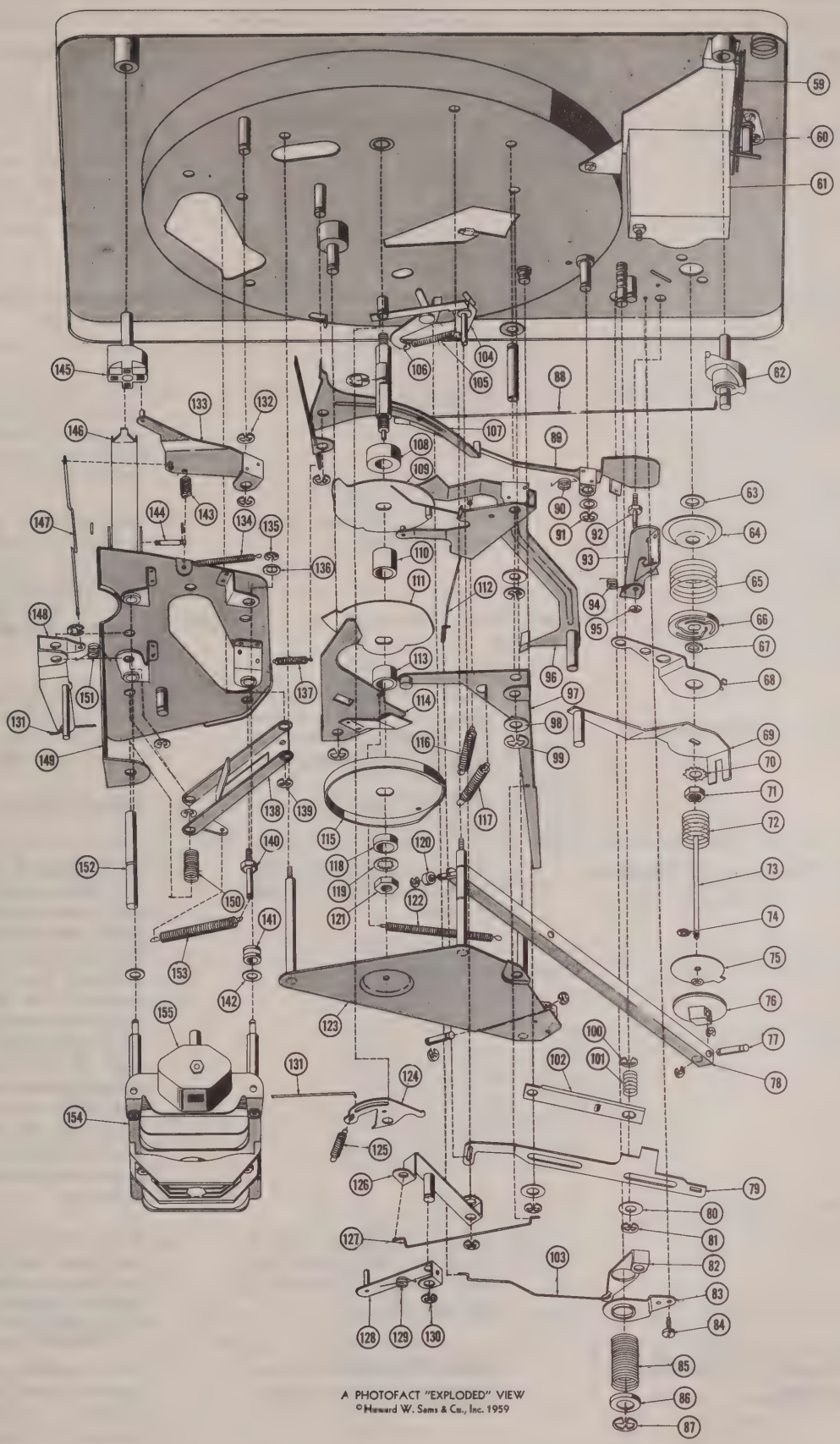


FIG. 4B EXPLODED VIEW OF PARTS BELOW BASEPLATE

TROUBLE CHART (CON'T.)

Symptom	Cause	Remedy
Changer will not start.	1. Microswitch defective.	1. Replace microswitch.
	2. Tab on automatic control arm (107) misadjusted.	2. Adjust the tab on automatic control arm (107) so that there is a clearance of .012 to .028 inch between the tab and the tail of support (51), which protrudes under the base plate.
	3. Automatic control wheel (49) defective.	3. Replace automatic control wheel (49).
Tone arm does not set down properly.	1. Inward movement swivel arm (96) distorted.	1. Bend inward movement swivel arm, so that it will operate at midheight between slide arm (79) and hook arm (93).
	2. Outward movement arm (97) distorted.	2. Bend the arm so that the operating end of the tone arm is high enough for the outward movement arm to operate at midheight of the boss on arm (69).
	3. Incorrect friction between discs (75) and (76) during the inward and outward movement of the tone arm.	3. Clean the friction surfaces of (75) and (76). Replace disc (76) if its cork surface is worn out.
	4. Shank of disc (75) distorted.	4. Replace disc (75).
Automatic stop does not function.	1. Too much friction between hook arm (93) and its boss.	1. When inward movement arm (96) is all the way out, hook arm (93) should move from end to end as the tone arm is raised and lowered. The wire spring attached to lever (82) should be resting on, but not pressing against, hook arm (93). The spring should press against the arm when the recording balancing arm reaches its end position and lever (82) is rotating in the opposite direction.
	2. Record balancing arm (1) does not lower under its own weight and action of spring (85).	2. Remove the record balancing arm and make sure the boss is not bent. Clean record balancing arm (1) with alcohol.
Record dropping cycle does not operate properly.	1. Spring attached to lever (114) has lost its tension.	1. The operating bar of the spindle should be pushed upwards, by the spring attached to lever (114), with a pressure of 5 5/16 oz.

Symptom	Cause	Remedy
	2. Operating bar does not function.	2. Replace the spindle.
	3. Retainer bar of spindle does not drop freely under its own weight.	3. Replace the spindle.
	4. Undersize or distorted center hole in record.	4. Do not use the record.
Gate finger (9) operation faulty.	1. Does not reach or overshoots its swing in the horizontal position.	1. Adjust the steel wire of arm (156) controlling slide arm (79).
	2. Spring (101) tension is not great enough to depress finger (9).	2. Adjust the friction by changing the position of circlip compressing spring (101).
	3. Too much play in arm (156).	3. Adjust the steel wire of arm (156) so that a slight amount of pressure is exerted between the boss of cam (109) and arm (156).
Trip mechanism does not function properly.	1. Too much friction between the tone arm and lever (68) is causing the mechanism to trip.	1. Clean between the tone arm and lever to remove any foreign matter.
	2. Not enough friction between the tone arm and lever (68); therefore, not enough pressure to actuate lever (89) and to trip the mechanism.	2. Replace the clutch.
	3. Spring (21) deformed.	3. Straighten or replace spring (21).
	4. Lever (89) jammed; will not rotate when actuated by lever (68).	4. Free lever (89); replace or reform if necessary.
	5. Spring (90) has lost its tension; therefore it does not pull lever (89) back to its rest position. As a result, changer trips while the record is being played or at the start of a record	5. Replace spring (90).
	6. Lever (89) does not contact spring (21) until the needle has covered the lead-out groove entirely.	6. Bend end of lever (89) so that it contacts spring (21) earlier.
Needle jumps out of the playing groove of the record.	1. Worn or chipped needle.	1. Replace the needle.
	2. Cartridge defective.	2. Replace the cartridge.
	3. Tone arm cannot swing freely.	3. Tone arm lead is out of its housing.
	4. Records warped or worn.	4. Do not use records.
	5. Base plate not level.	5. Level base plate.

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description
1	G14159	Record Balancing Arm
2		Tone Arm
3	18N55.25	Spring
4		Tone Arm Shaft & Hinge Ass'y.
5		Tone Arm Inward & Outward Adj. Screw
6		Tension Spring
7		Spacer
8		Housing
9		Record Size Finger
10	1, 5N48.4	"C" Washer
11		Record Size Finger Actuating Lever
12	1, 5N48.4	"C" Washer
13		Set Screw
14	P14153	Stop-On-Rej. Knob
15		"C" Washer
16		Tone Arm Rest. Ass'y.
17		Baseplate
18	10UNI3653	Circlip
19	P14146/3	Rubber Turntable Mat
20	G14006	Turntable
21	9N55.29	Spring
22		Flat Washer
23		Ball Race
24		Flat Washer
25		Washer
26	4N48.4	Circlip
27		Flat Washer
28		Hex Nut
29	6N47.14	Spring Washer
30		Spacer
31		Gear
32		Record Size Finger Mounting Bracket
33		Screw
34		Spacer
35		Spring
36		Locking Disc
37	6N48.4	Circlip
38		Flat Washer
39	3, 2N48.4	Circlip
40		Plug in Cartridge
41	2, 3N48.4	Circlip
42		Rubber Drive Wheel Clamp
43	G13982	Rubber Drive Wheel
44		Rubber Drive Wheel Mtg. Bracket
45		Motor Pulley
46		Set Screw
47	3, 2N48.4	Circlip
48		Spring
49	P13992	Rubber Ring Automatic Control Wheel
50		Gear
51		Drive Gear Mtg. Bracket
52	P14154/4	Speed Change Knob
53		Set Screw
54		Nut
55		"C" Washer
56		Hex Nut
57		Spindle Ass'y.
58		Screw
59		Switch Lever

Ref. No.	Part No.	Description
60		Switch Button
61		Switch Cover
62		Switch Actuating Cam
63		Flat Washer
64		Spring Retaining Collar
65	6N55.22	Spring
66		Spring Retaining Collar
67		Spacer
68		Lever
69		Lever
70		Spring Washer
71	P13344	Hex Nut
72		Compression Spring
73		Push Rod
74		Circlip
75		Disc
76		Disc
77		Disc Mtg. Pin
78		Arm
79		Slide Arm
80		Flat Washer
81	4N48.4	Circlip
82		Automatic Shut Off Actuating Lever
83		Compression Spring Bracket
84	3X7UNI240A	Screw
85	2N55.22	Spring
86		Collar
87	6N48.4	Circlip
88		Reject Rod
89		Auto Stop Lever
90	7N55.29	Spring
91	3, 2N48.4	Circlip
92		Hook Arm Mtg. Stud
93		Hook Arm
94	4N55.25	Spring
95	3, 2N48.4	Circlip
96		Swing Arm
97		Outward Movement Arm
98		Flat Washer
99	4N48.4	Circlip
100		Circlip
101		Spring
102		Lever
103		Automatic Shut Off Connecting Rod
104		Trip Lever
105		Spring
106		Trip Pawl Lock
107		Automatic Control Arm
108		Spacer
109		Upper Cam
110		Spacer
111		Cam
112		Slide Arm Actuating Rod
113		Spacer
114		Record Dropping Lever
115		Lower Cam
116	8N55.25	Spring
117	8N55.27	Spring
118		Spacer
119	6N47.14	Spring Washer
120		Roller
121	6UNI207A	Nut
122		Spring

Ref. No.	Part No.	Description
123		Mtg. Plate
124		Pawl
125	13N55.25	Spring
126		Pawl Actuating Lever
127		Pawl Actuating Lever Rod
128		Pawl Release Lever
129	6N55.29	Spring
130	3, 2N48.4	Circlip
131		Drive Wheel Disengaging Rod
132	3, 2N48.4	Circlip
133		Speed Selector Plate
134	5N55.25	Spring
135	3, 2N48.4	Circlip
136		Flat Washer
137	2N55.25	Spring
138		Drive Wheel Lever
139	1, 5N48.4	Circlip

Ref. No.	Part No.	Description
140	G14061	Stud and Nut
141	P14068	Grommet
142		Flat Washer
143	5N55.25	Spring
144		Pin
145		Speed Change Cam
146		Drive Wheel Shift Lever
147		Drive Wheel Disengaging Rod
148		Drive Wheel Disengaging Lever
149		Motor Mounting Plate
150	1N55.22	Spring
151		Spring
152		Speed Change Shaft
153	4N55.25	Spring
154	113700/5	Motor
155		AC Cover
156		Record Size Finger Operating Arm

PHOTOFACT* Folder with CIRCUITRACE*

EIA MEMBER

LINMARK
MODELS T-60, T-61

LINMARK
MODELS T-60, T-61

MODEL T-61

LINMARK
MODELS T-60, T-61

TRADE NAME	Linmark Model T-60, T-61
IMPORTER	Shriro, Inc., 276 Fourth Ave, New York 10, N. Y.
TYPE SET	Battery Operated Portable Transistorized AM Receiver
POWER SUPPLY	9 Volts DC
TUNING RANGE—BROADCAST	525 — 1650KC
RATING	6.5MA @ 9 Volts DC (No Signal, Min. Volume) 7.5MA @ 9 Volts DC (Signal, Normal Volume)

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.

Suggested alignment tools:

A1, A2, A3.....GENERAL CEMENT #8607, 9291
WALSCO #2520, 2522, 2523, 2524, 2537

A4.....GENERAL CEMENT #8282, 8606, 8606L, 9091
WALSCO #2526, 2541, 2543, 2544

A5, A6.....GENERAL CEMENT #9087, 9089
WALSCO #2528

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.		Loop	455KC	Tuning gang fully open	Across voice coil	A1, A2, A3	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
2.		"	525KC	Tuning gang fully closed	"	A4	"
3.		"	1650KC	Tuning gang fully open	"	A5, A6	"
4.		"	650KC	650KC	"	A7	"

DISASSEMBLY

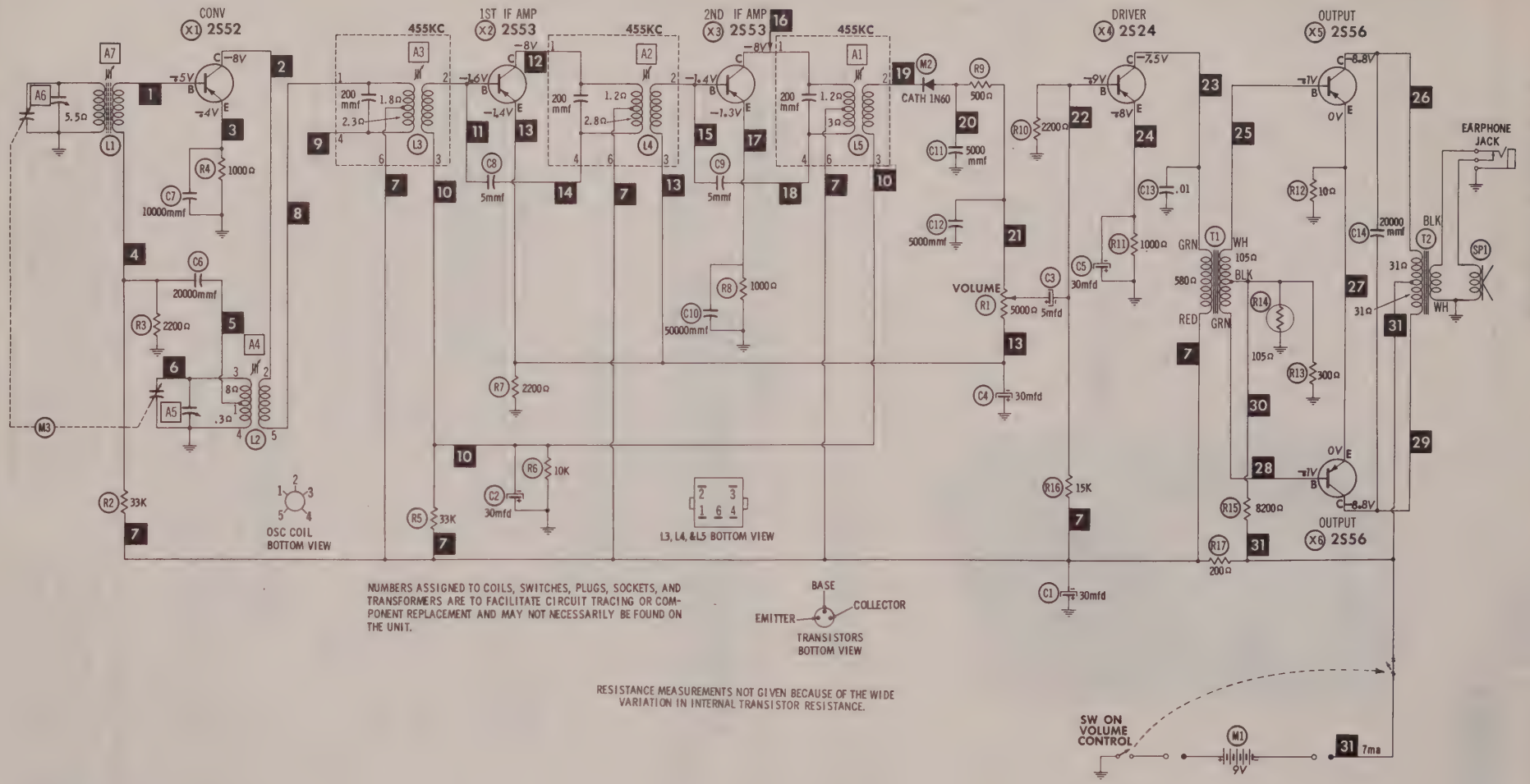
1. Insert coin in cabinet slot; twist coin and remove rear cover.
2. Remove 2 screws holding front metal trim.
3. Release inside tabs holding metal trim at bottom. Remove trim.
4. Remove screw holding dial indicator wheel. Remove wheel.
5. Remove 3 screws holding chassis. Remove chassis.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1959 Howard W. Sams & Co., Inc., Indianapolis 6, Indiana. Printed in U.S. of America

JF221

SET 456 FOLDER 14



NUMBERS ASSIGNED TO COILS, SWITCHES, PLUGS, SOCKETS, AND TRANSFORMERS ARE TO FACILITATE CIRCUIT TRACING OR COMPONENT REPLACEMENT AND MAY NOT NECESSARILY BE FOUND ON THE UNIT.

RESISTANCE MEASUREMENTS NOT GIVEN BECAUSE OF THE WIDE VARIATION IN INTERNAL TRANSISTOR RESISTANCE.

❸ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE®

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LINMARK
MODELS T-60, T-61

PARTS LIST AND DESCRIPTIONS

TRANSISTORS

ITEM No.	ORIG. TYPE	USE	REPLACEMENT DATA				NOTES
			CBS PART No.	RCA PART No.	RAYTHEON PART No.	SYLVANIA PART No.	
X1	2S52	Converter			2N483		PNP
X2	2S53	1st IF Amplifier			2N483		PNP
X3	2S53	2nd IF Amplifier			2N483		PNP
X4	2S24	Driver			2N362		PNP
X5	2S56	Output			2N632		PNP
X6	2S56	Output			2N632		PNP

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	LINMARK PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	
C1	30	6		PWE6030	NLW30-6	TT6X30	ML30-6	TE-1092	
C2	30	3		XPP3030	NLW30-6	TT40X3		TE-1092	
C3	5	3		XPP3005	NLW5-6	TT6X5	ML5-6	TE-1052. 3	
C4	30	3		XPP3030	NLW30-6	TT40X3		TE-1092	
C5	30	3		XPP3030	NLW30-6	TT40X3		TE-1092	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	LINMARK PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C6	20000				C-80V203AM	DDM-203	H-05S2	TA-120	TG-S20	
C7	10000				C-80V103AM	DDM-103	H-05S1	TA-110	TG-S10	
C8	5				SI 5	DD-050	L10V5	ZT-555	5GA-V5	
C9	5				SI 5	DD-050	L10V5	ZT-555	5GA-V5	
C10	50000				C-80V503AM	DDA-503	H-05S5	TA-150	TG-S50	
C11	5000				C-80V502AM	DM-502	H-05D5	TA-250	TG-D50	
C12	5000				C-80V502AM	DM-502	H-05D5	TA-250	TG-D50	
C13	.01	200			C-80V103AM	DDM-103	H-05S1	BT-110	TG-S10	
C14	20000				C-80V203AM	DDM-203	H-05S2	TA-120	TG-S20	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	LINMARK PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	5000Ω	1/4		B16-214				Volume & Switch

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		LINMARK PART No.	NOTES
	OHMS	WATT		
R2	33K			
R3	2200Ω			
R4	1000Ω			
R5	33K			
R6	10K			
R7	2200Ω			
R8	1000Ω			
R9	500Ω			

ITEM No.	RATING		LINMARK PART No.	NOTES
	OHMS	WATT		
R10	2200Ω			
R11	1000Ω			
R12	10Ω			
R13	300Ω			
R14				Temp. Compensating
R15	8200Ω			
R16	15K			
R17	200Ω			

PRINTED BOARD

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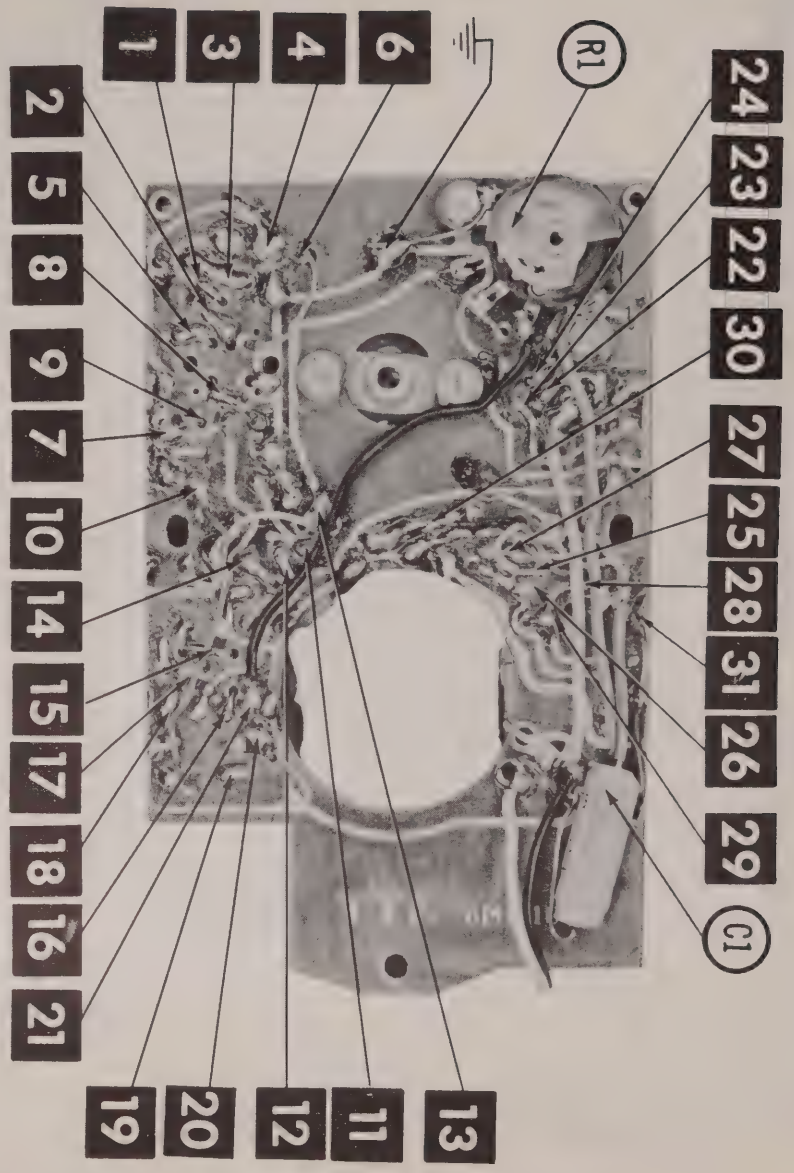


PARTS LIST & DESCRIPTION (continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA						NOTES
		LINMARK PART No.	Gramer PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	Loopstick							
L2	Osc. Coil							
L3	1st IF Trans.							
L4	2nd IF Trans.							
L5	3rd IF Trans.							

TRANSFORMER (DRIVER)

ITEM No.	TURNS RATIO		REPLACEMENT DATA						NOTES
	PRI.	SEC.	LINMARK PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	1.5	1	M-6T1						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	LINMARK PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	1200Ω CT	6-8Ω	M-6T2	TR-27			TA-29	TR-27		

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	LINMARK PART No.	QUAM PART No.	
SP1	2 1/4"	PM	6-8Ω			

BATTERIES

ITEM No.	VOLTAGE	LINMARK PART No.	REPLACEMENT DATA						NOTES
			BURGESS		EVEREADY		MALLORY		
			"A"	"B"	"A"	"B"	"A"	"B"	
M1	9V			2U6		216		TR-146R	

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		LINMARK PART No.	CBS PART No.	SYLVANIA PART No.	
M2	1N60		1N60	1N60	Detector (Pigtail)

MISCELLANEOUS

ITEM No.	PART NAME	LINMARK PART No.	NOTES
M3	Tuning Cap		2 Gang

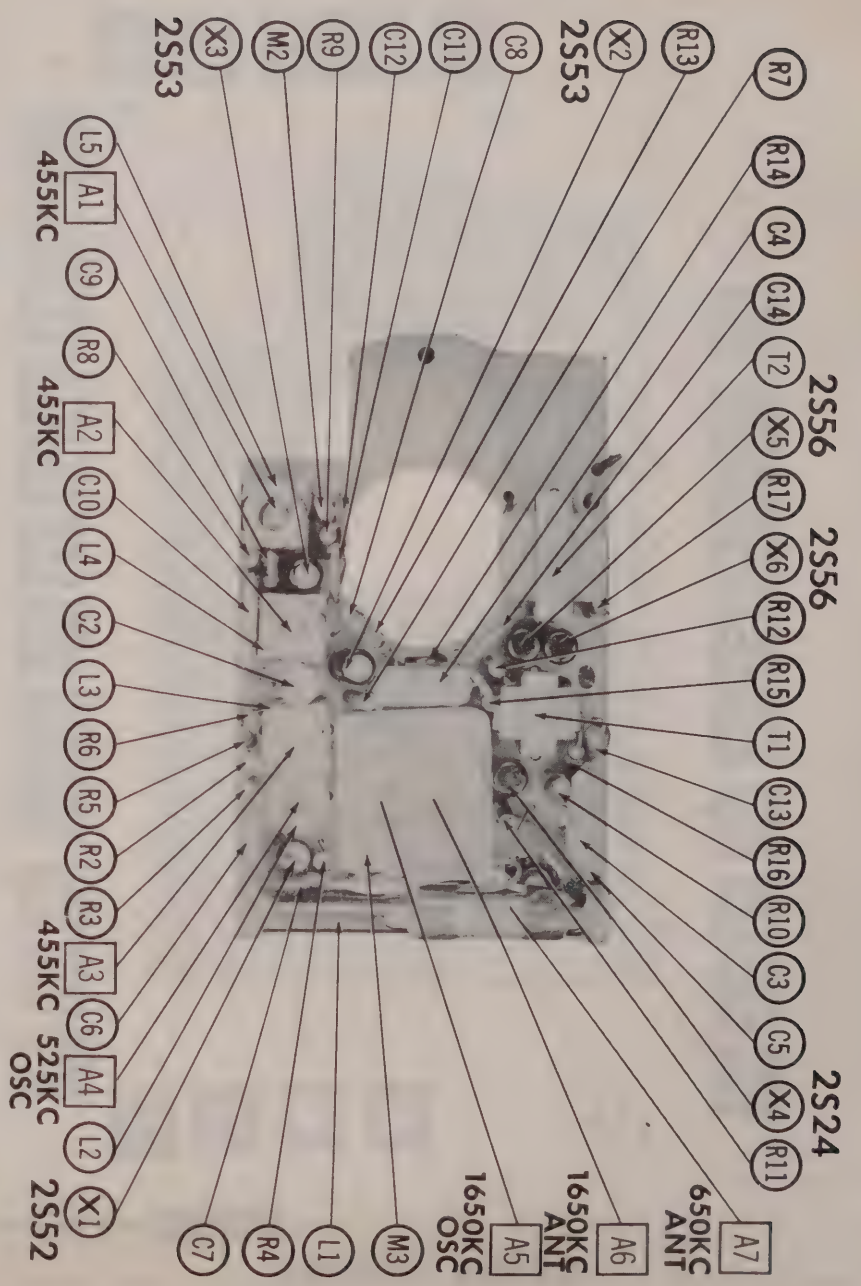
CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

WIRING DATA

General-use Unshielded Hook-up Wire .....Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

CHASSIS—TOP VIEW

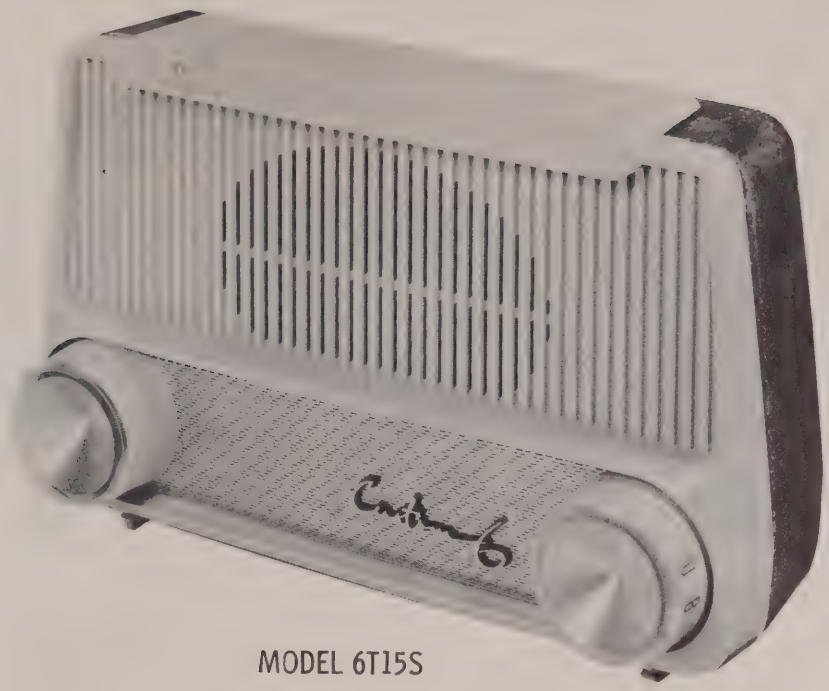


PHOTOFACT* Folder with CIRCUITRACE*

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

MOTOROLA MODELS 6T15N, S (Ch. HS-680)

MOTOROLA MODELS 6T15N, S (Ch. HS-680)



MODEL 6T15S

MOTOROLA MODELS 6T15N, S (Ch. HS-680)

TRADE NAME	Motorola Models 6T15N, 6T15S (CH. HS-680)
MANUFACTURER	Motorola Inc., 4545 W. Augusta Blvd., Chicago 51, Illinois
TYPE SET	AC-DC Operated 6 Tube AM Receiver
POWER SUPPLY	110 - 120 Volts AC-DC
RATING	30 Watts, .31 Amp. @117 Volts AC
TUNING RANGE—BROADCAST	532KC-1620KC

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.

Suggested alignment tools:
A1, A2, A3, A4, A8..... GENERAL CEMENT #8606, 8606L, 8282, 9295
WALSCO #2526, 2543, 2544, 2545
A5, A6, A7..... GENERAL CEMENT #5004, 5008, 5009
WALSCO #2520

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1mfd	High side to pin 7 (grid) of Converter. Low side to chassis.	455KC (400∿ Mod.)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	"	"	1620KC	"	"	A5	"
3.		Loop	1400KC	1400KC	"	A6, A7	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
	The following steps are not necessary unless RF coil (L2) has been tampered with or associated components have been replaced. Repeat Step 2.						
4.		Loop	600KC	600KC	Across voice coil	A8	Adjust for maximum output.
5.		"	1400KC	1400KC	"	A6	"

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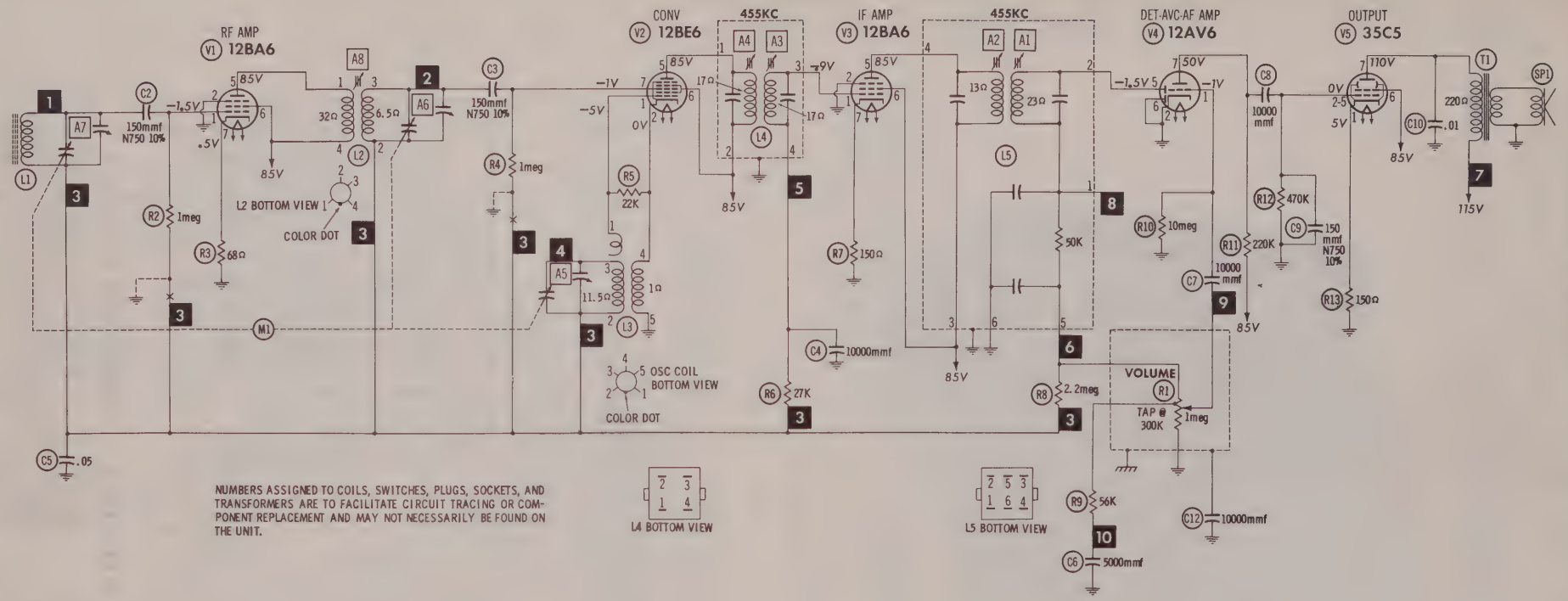
JG217

SET 456 FOLDER 15

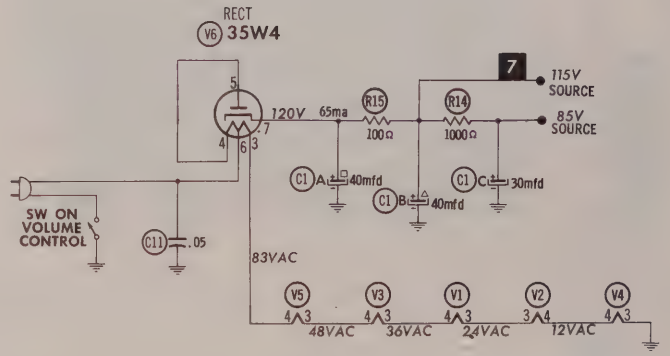


1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12BA6	4.2meg	0Ω	24Ω	36Ω	†1100Ω	†1100Ω	68Ω
V2	12BE6	22K	1Ω	24Ω	12Ω	†1100Ω	†1100Ω	4.2meg
V3	12BA6	3.2meg	0Ω	36Ω	48Ω	†1100Ω	†1100Ω	150Ω
V4	12AV6	10meg	0Ω	0Ω	12Ω	1meg	0Ω	†220K
V5	35C5	150Ω	470K	48Ω	83Ω	470K	†1100Ω	†320Ω
V6	35W4	NC	NC	83Ω	120Ω	120Ω	110Ω	¶

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
† MEASURED FROM PIN 7 OF V6
NC NO CONNECTION



⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE®

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MOTOROLA MODELS 6T15N, S (Ch. HS-680)

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier	12BA6	
V2	Converter	12BE6	
V3	IF Amplifier	12BA6	

ITEM No.	USE	TYPE	NOTES
V4	Det-AVC-AF Amp.	12AV6	
V5	Output	35C5	
V6	Rectifier	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	MOTOROLA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	■40	150	23B639496	AFH3-11-30	C0090 ‡	PFP311.63		PCLS-3439.1*	
B	▲40	150							
C	30	150							

‡ Use Printed Circuit Adapters #55277 & 55278
* Not normally in distributor's stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	MOTOROLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	150		N750 10%	21K127652	N750-DI 150	DTN-150	C10T15U	CN7-315	5TCU-T15	
C3	150		N750 10%	21K127652	N750-DI 150	DTN-150	C10T15U	CN7-315	5TCU-T15	
C4	10000			21R128284	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C5	.05	400		8K121268	P485N-05	DF-503	CUB4S5	GTM-415	4TM-S5	
C6	5000			21K633232	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C7	10000			21R128284	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C8	10000			21R128284	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C9	150		N750 10%	21K127652	N750-DI 150	DTN-150	C10T15U	CN7-315	5TCU-T15	
C10	.01	400		21K533472	P485N-01	DD-103	CUB4S1	GTM-411	4TM-S1	
C11	.05	400		8K121268	P485N-05	DF-503	CUB4S5	GTM-415	4TM-S5	
C12	10000			21R128284	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	MOTOROLA PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A B	1meg Switch	½	18B640959					Volume, Tap @ 300K Power, Push-Pull

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		MOTOROLA PART No.	NOTES
	OHMS	WATT		
R1	1meg		6K122324	
R3	68Ω		6R2039	
R4	1meg		6K122324	
R5	22K		6K119405	
R6	27K		6K121300	
R7	150Ω		6K124797	
R8	2.2meg		6R3927	

ITEM No.	RATING		MOTOROLA PART No.	NOTES
	OHMS	WATT		
R9	56K		6K127541	
R10	10meg		6K119408	
R11	220K		6R6015	
R12	470K		6K119406	
R13	150Ω		6K124797	
R14	1000Ω		6R6327	
R15	100Ω		6R6326	

PRINTED BOARD

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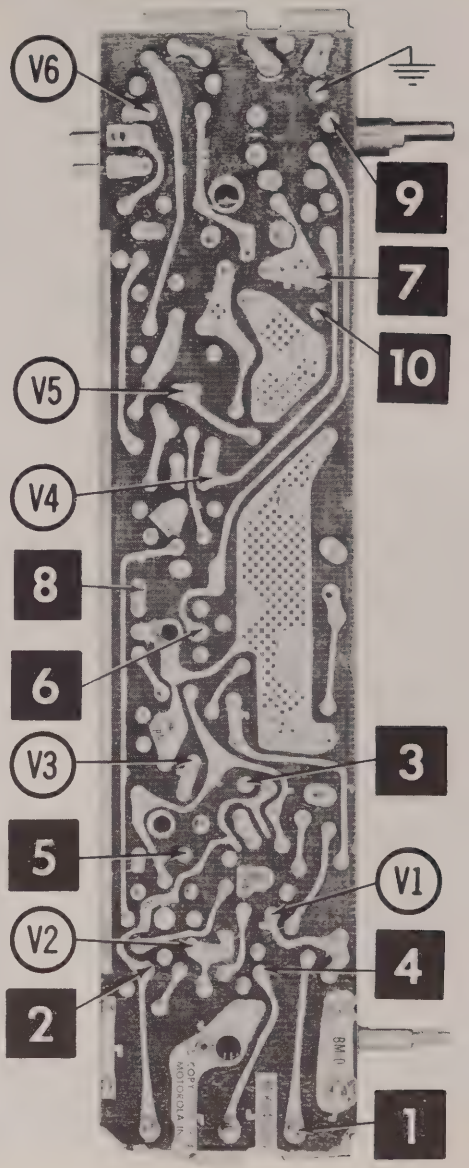
ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA						NOTES
		MOTOROLA PART No.	Gramer PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	Loopstick	1V641352						
L2	RF Trans.	24B641321						
L3	Osc. Trans.	24B641320						
L4	Input IF	24K641313	16-6786	16-6786	BC-356	13-PC9	RF-Y	
L5	Output IF	24K641314						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	3300Ω	3-4Ω	25K640899	24S46①	A-3031①	AU-603①	A-3876①	22S46①	S-16X①	① Use original channel frame

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	MOTOROLA PART No.	QUAM PART No.	
SP1	4"x 6"	PM	3-4Ω	50C640765	46A15	

MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M1	Tuning Cap Printed Board	19C641067 1V641355	3 Gang Includes #84K643250, 84K641380 or 84K643200 (Less all components)

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

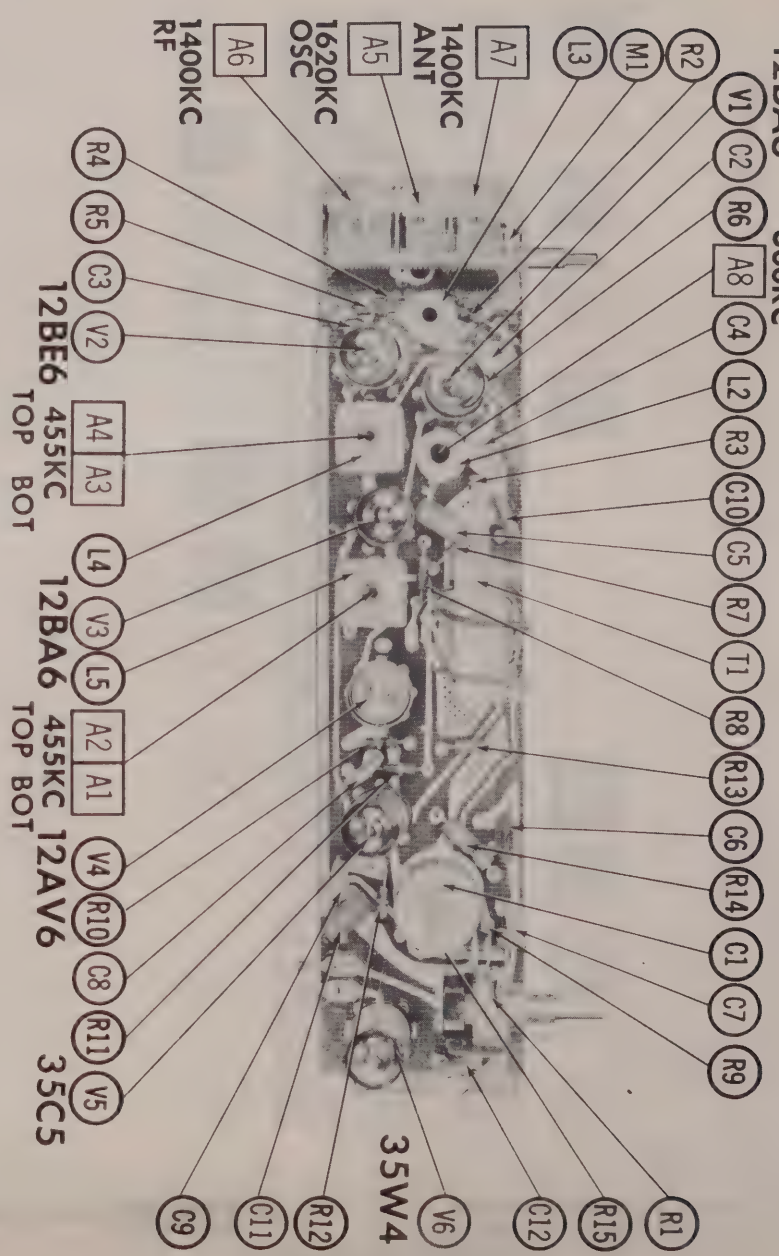
NAME	PART NO.	DESCRIPTION
Knob	36C641020	Tuning
Knob	36C641022	Loudness-On-Off
Knob	36K641027	Loudness Indicator, Model 6T15S
Knob	36K641028	Loudness Indicator, Model 6T15N
Knob	36K641064	Dial Scale, Model 6T15S
Knob	36K641065	Dial Scale, Model 6T15N
Cabinet Front	1V641362	Tan, Model 6T15S
Cabinet Front	1V641361	Brown, Model 6T15N
Cabinet Rear	16K641010	Tortoise Shell

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord (Interlock Type) ..... Use BELDEN No. 8874

CHASSIS—TOP VIEW



PHOTOFACT* Folder

MODEL R-12

TRADE NAME	Muntz Models R-10 (Revised), R-12
MANUFACTURER	Muntz TV Inc., 1000 Grey Ave., Evanston, Illinois
TYPE SET	AC Operated 4 Tube AM Receiver With Electric Clock
POWER SUPPLY	110-120 Volts AC, 60 Cycles
RATING	25 Watts, .27 Amp. @117 Volts AC (Less Clock)
TUNING RANGE—BROADCAST	535 – 1620KC

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.
Use isolation transformer, if available. If not, connect a .1mfd capacitor in series with low side of signal generator.
Suggested Alignment Tools: A1, A2.....GENERAL CEMENT #8282, 8606, 8606L, 9091
WALSCO #2526, 2541, 2543, 2544
A3, A4.....GENERAL CEMENT #5004, 5008, 5009
WALSCO #2520

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01mfd	High side to pin 1 (grid) of Converter. Low side to chassis.	455KC (400~ Mod.)	Tuning gang fully open.	Across voice coil	A1, A2	Adjust for maximum output.
2.		Loop	1620KC	"	"	A3, A4	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	600KC	600KC	"		Check tracking.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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MUNTZ MODELS
R-10 (Revised), R-12
MUNTZ MODELS
R-10 (Revised), R-12
SET 456 FOLDER 16

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Converter	12AU6	
V2	Det. -AF Amp.	12AV6	

* Alternate

ITEM No.	USE	TYPE	NOTES
V3	Output	50C5	50EH5 *
V4	Rectifier	50DC4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	MUNTZ PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	40	150	CE-8003	PRS150/25V	BBRT42215	TCT3114	TDLT-3	TVA-3448	
B	20	150		4020/20					
C	20	15							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	MUNTZ PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	100			CC-0163	SI 100	D6-101	L10T1	UC-531	5GA-T1	
C3	56				SI 56	D6-560	L10Q56	UC-5456	5GA-Q56	
C4	56				SI 56	D6-560	L10Q56	UC-5456	5GA-Q56	
C5	10000			CC-0216	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C6	10000			CC-0216	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C7	.047	600		CP-0064	P688N-047	DF-503	CUB6S47	GEM-6147	6TM-S47	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	MUNTZ PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	2.5meg	½	8009	B-83	A47-2.5meg-S	Q11-239	U255	Volume Note 1
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	

Note 1. Model R-10 Revised may use 2.5meg volume with switch, Part #VC8007.

RESISTORS

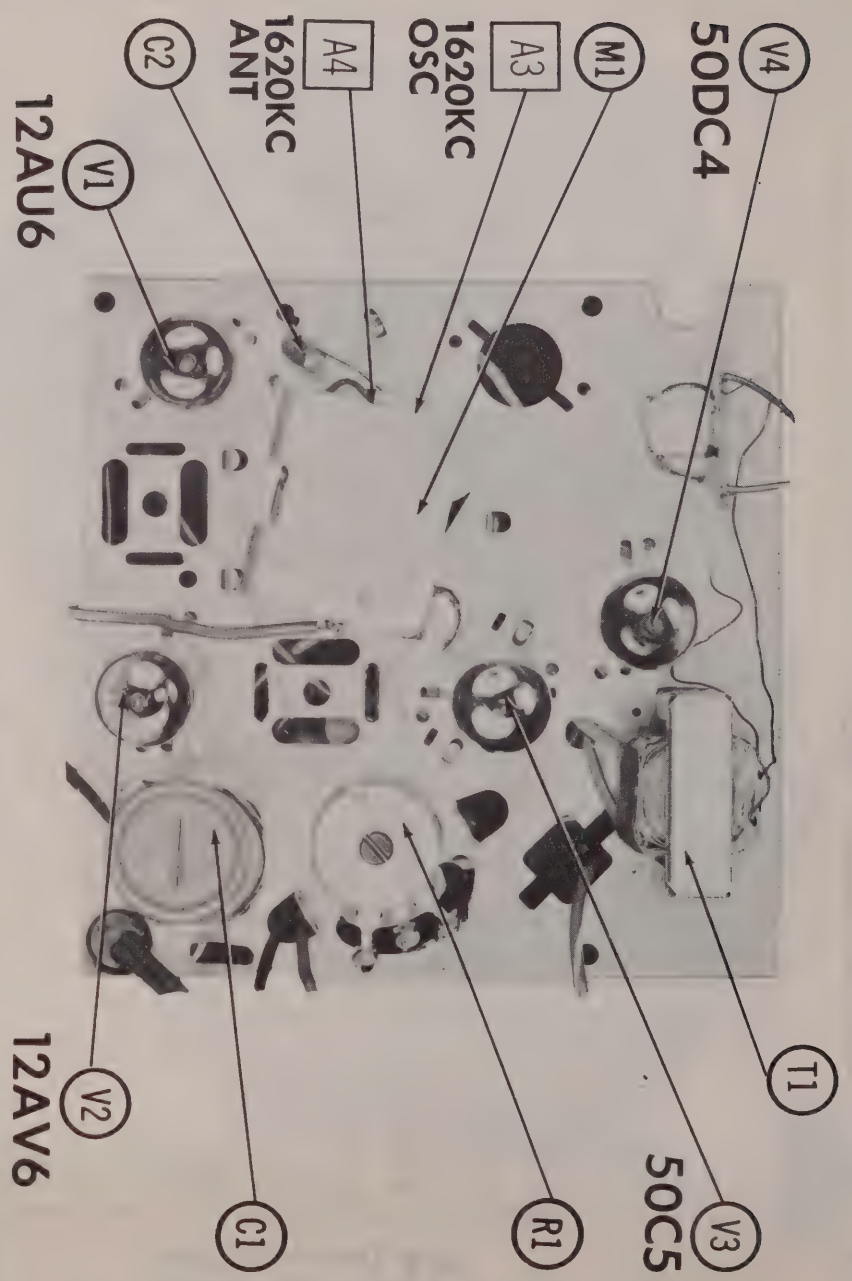
All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		MUNTZ PART No.	NOTES
	OHMS	WATT		
R2	2.7meg		RC-2704-18	
R3	180Ω 5%			Note 1

ITEM No.	RATING*		MUNTZ PART No.	NOTES
	OHMS	WATT		
R4	2200Ω		RC-022-18	Note 2
R5	22Ω			

Note 1. Some versions may use 82Ω in this application(Part #RC-082-18).
Note 2. Some versions may use 1000Ω or 1200Ω in this application.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	MUNTZ PART No.	REPLACEMENT DATA
K1	Detector-AVC-Audio	250mmf, 220mmf, 2000mmf, 5000mmf, 470K, 470K, 6.8meg	CC-8002	Aerovox PA-113-1 Centralab PC-150 Cornell-Dubilier 116TM1 Sprague DT-1

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA						NOTES
		MUNTZ PART No.	Gramer PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1 L2 L3A B	Loop Ant. Osc. Coil IF Pri. IF Sec.	AN-0024 LO-8004 LI-8003						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	MUNTZ PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2200Ω	3-4Ω	TA-8003	24S53	A-3025	AU-605	A-3332	24S53	S-12X	

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	MUNTZ PART No.	QUAM PART No.	
SP1	4"	PM	3-4Ω	SK-0034	4A07	

MISCELLANEOUS

ITEM No.	PART NAME	MUNTZ PART No.	NOTES
M1	Tuning Cap. Alt. Tuning Cap	CT-8004	2 Gang (Ant. 15-351mmf, Osc. 11-108mmf) 2 Gang (Ant. 7-276mmf, Osc. 8-105mmf)

CABINETS & CABINET PARTS

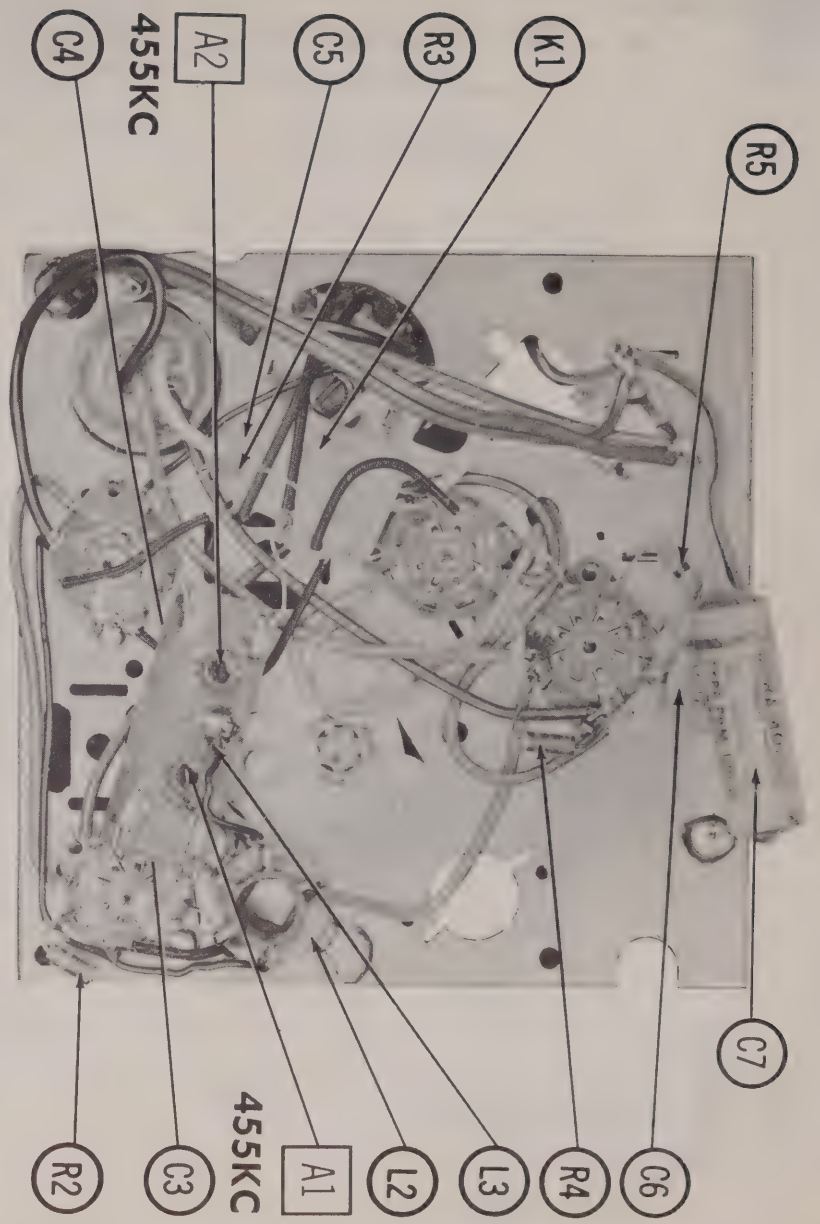
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

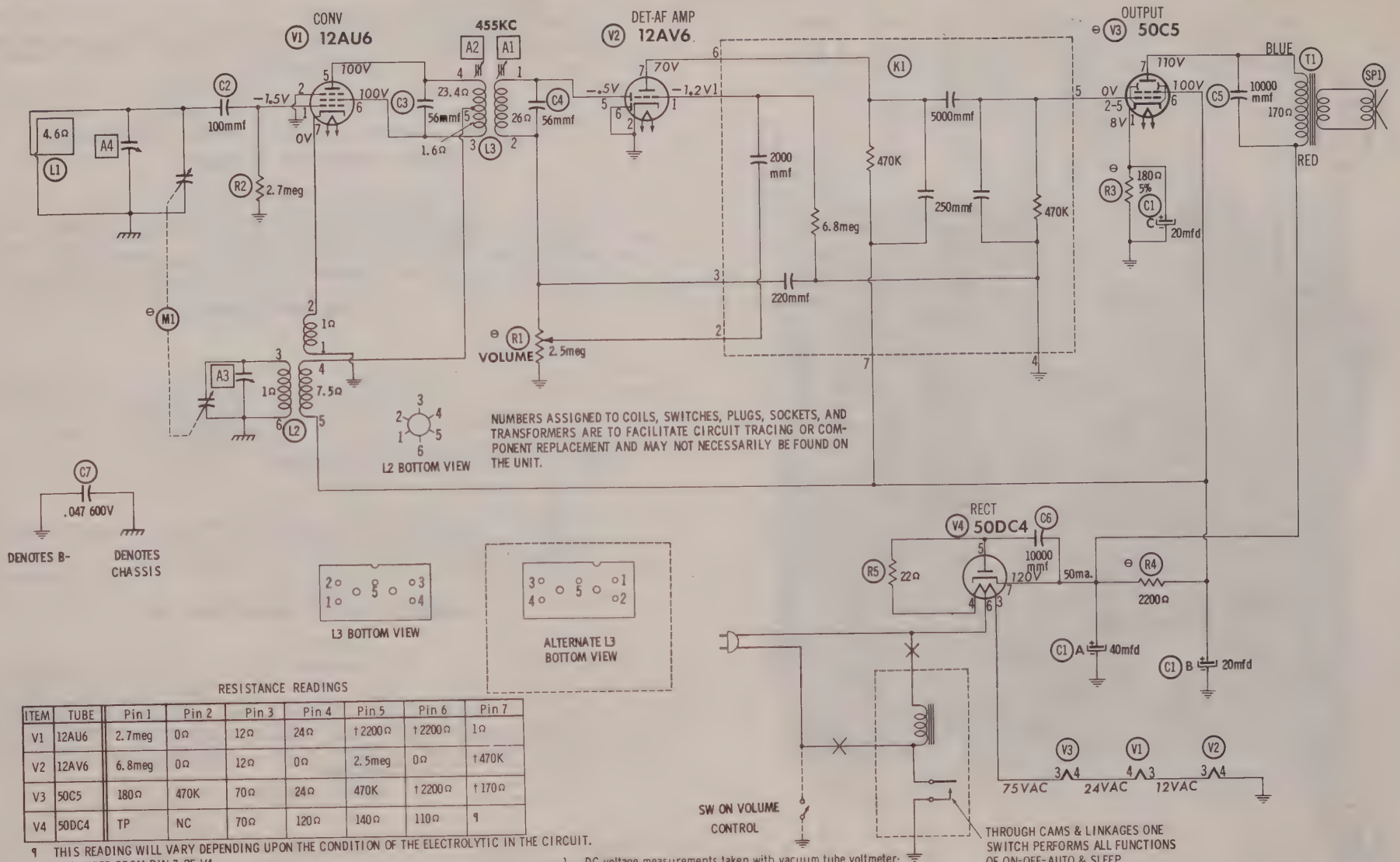
WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

CHASSIS BOTTOM VIEW





RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12AU6	2.7meg	0Ω	12Ω	24Ω	†2200Ω	†2200Ω	1Ω
V2	12AV6	6.8meg	0Ω	12Ω	0Ω	2.5meg	0Ω	†470K
V3	50C5	180Ω	470K	70Ω	24Ω	470K	†2200Ω	†170Ω
V4	50DC4	TP	NC	70Ω	120Ω	140Ω	110Ω	¶

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
† MEASURED FROM PIN 7 OF V4
NC NO CONNECTION
TP TIE POINT

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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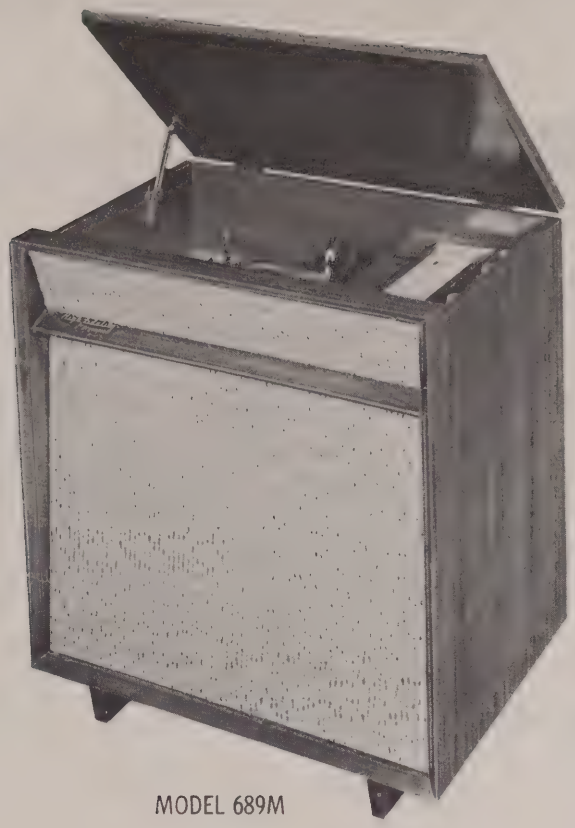
MUNTZ MODELS
R-10 (Revised), R-12

PHOTOFACT* Folder

OLYMPIC MODELS
A590, 589, 689M



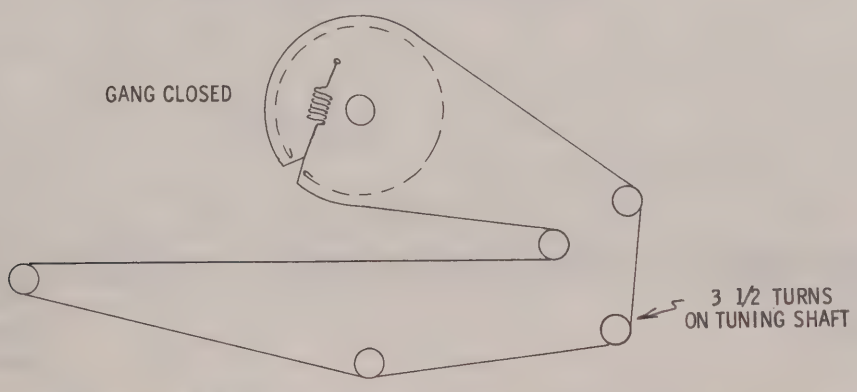
MODEL 689M

OLYMPIC MODELS
A590, 589, 689M

TRADE NAME	Olympic Models A590, 589, 689M	
MANUFACTURER	Olympic Radio & Tel., Inc., 34-01 38th St., Long Island City 1, N. Y.	
TYPE SET	AC Operated 7 Tube FM-AM Receiver with 4 Speed Automatic Record Changer	
POWER SUPPLY	110-120 Volts AC, 60 Cycles	RATING 46 Watts, .45 Amp. @ 117 Volts AC
TUNING RANGE-BROADCAST	535-1700KC	FREQ. MOD. 88-108MC

FOR SERVICE INFORMATION ON RECORD CHANGER PART #RX5743 - SEE SIMILAR V-M 1200A - PHOTOFACT SET 353 FOLDER 16 OR RECORD CHANGER MANUAL RC-10.

DIAL CORD STRINGING



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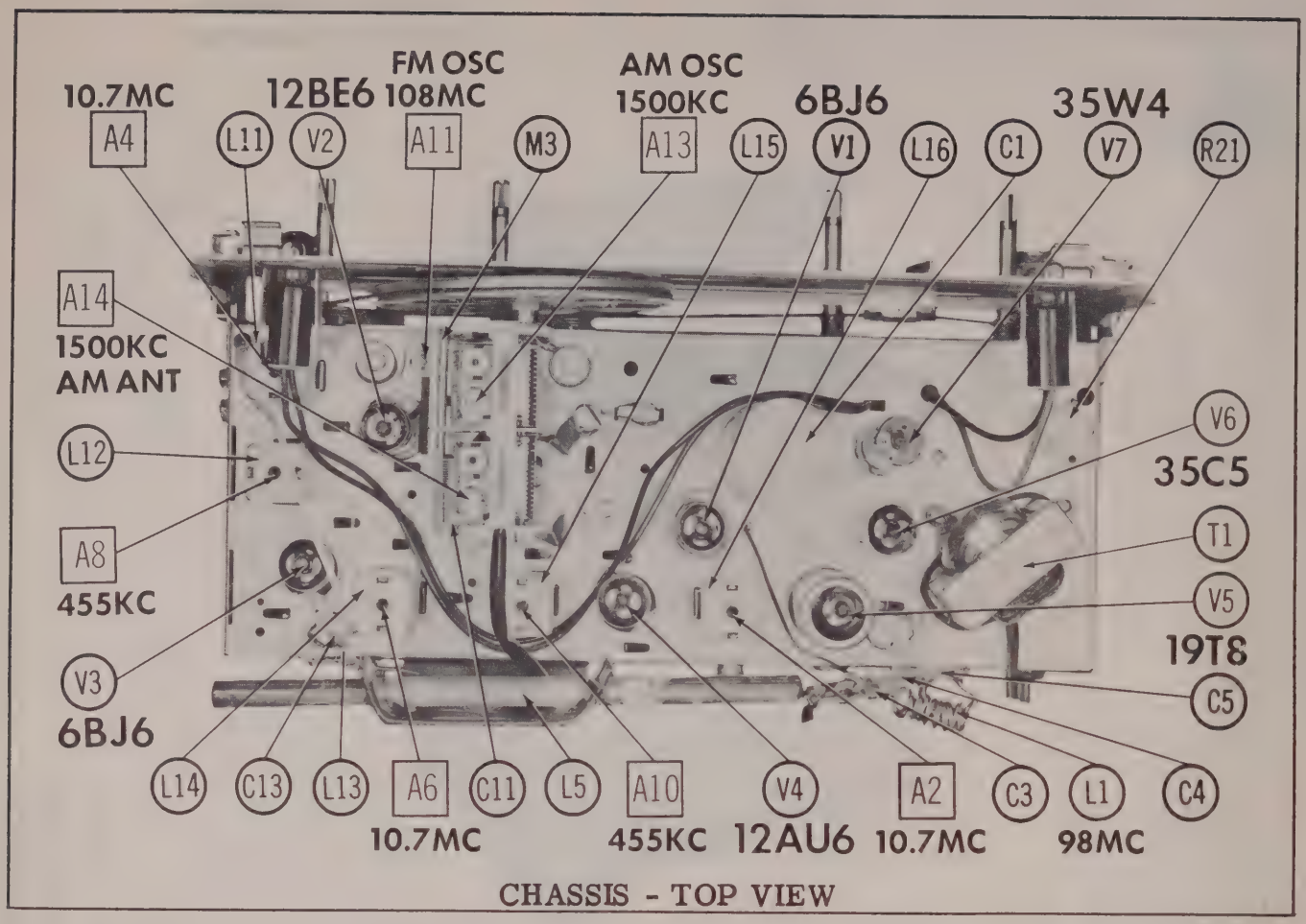
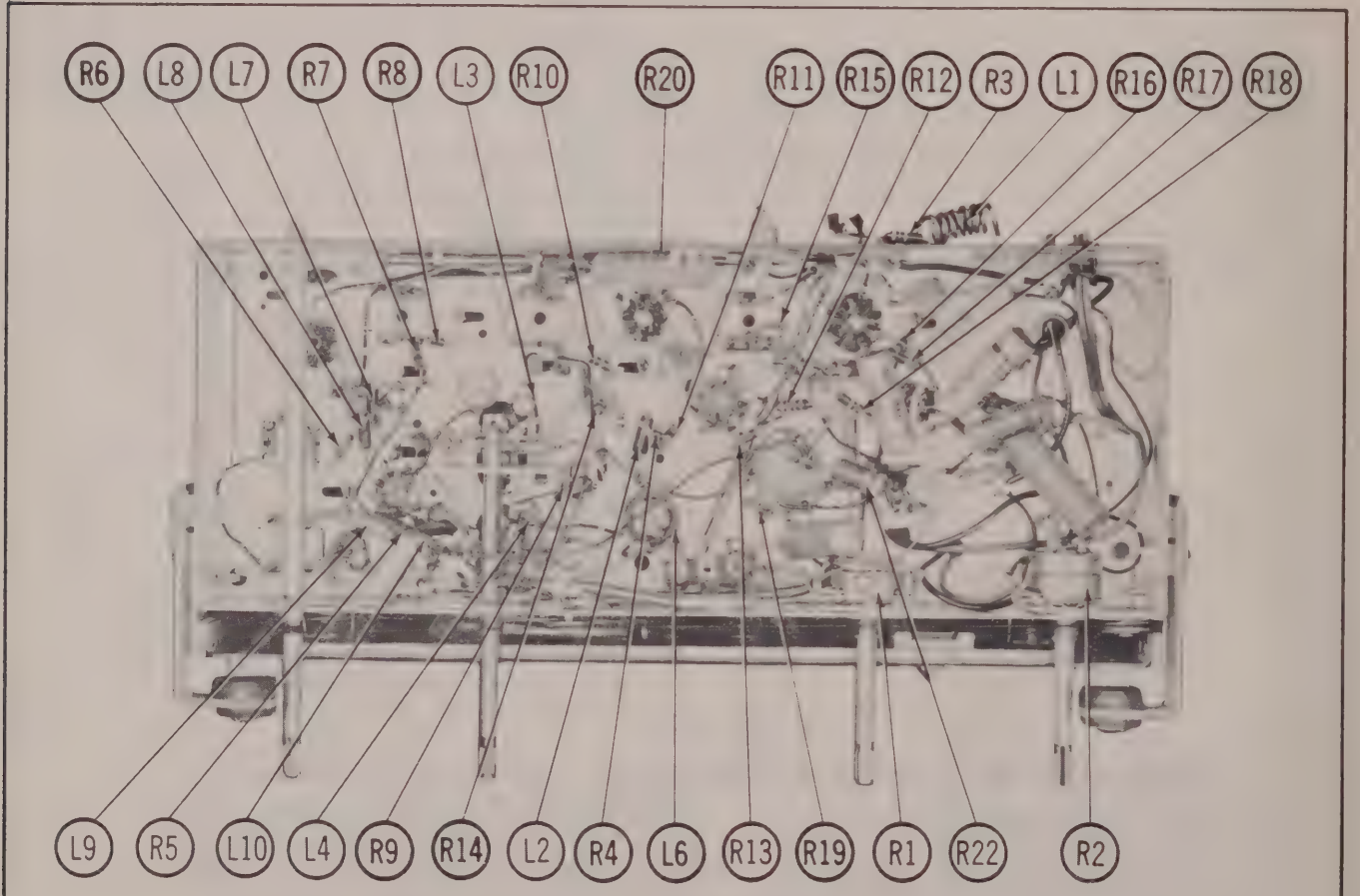
JM160

SET 456 FOLDER 17



CHASSIS - TOP VIEW



CHASSIS BOTTOM VIEW - INDUCTOR & RESISTOR IDENT

ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.
Suggested Alignment Tools:
A1 thru A6 ..... GENERAL CEMENT #8606, 8606L, 8282, 9295
WALSCO #2526, 2543, 2544, 2545
A7 thru A10 .....GENERAL CEMENT #5097, 8727
WALSCO #2515
All ..... GENERAL CEMENT #8721, 8722
WALSCO #2519
A12, A13, A14 ..... GENERAL CEMENT #5004, 5008, 5009
WALSCO #2520

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two 47K matched (±1%) resistors in series from point Ⓐ to chassis. The junction of these resistors is alignment point Ⓑ as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1.	.1mfd	High side to pin 1 (grid) of 2nd FM IF Amp. Low side to chassis.	10.7MC (Unmod)	FM	Tuning gang fully open	DC probe to point Ⓐ. Common to point Ⓑ.	A1	Adjust for maximum deflection.
2.	"	"	"	"	"	DC probe to point Ⓒ. Common to point Ⓑ.	A2	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
3.		High side to two turn loop around converter tube. Low side to chassis.	"	"	"	DC probe to point Ⓐ. Common to point Ⓑ.	A3, A4, A5, A6	Adjust for maximum deflection. Remove the two 47K resistors.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
1.		High side to two turn loop around converter. Low side to chassis.	10.7MC (450KC Swp)	FM	Tuning gang fully open	Vert. Amp. to point Ⓐ. Low side to chassis.	A1, A3, A4, A5, A6	Disconnect stabilizing capacitor (C2). Adjust for maximum gain and symmetry of response similar to Fig. 1 with markers as shown.
2.		"	"	"	"	Vert. Amp. to point Ⓒ. Low side to chassis.	A2	Reconnect C2. Adjust so that 10.7MC marker occurs at center of crossover lines as in Fig. 2. Retouch A1 for maximum amplitude and straightness of crossover lines.

AM IF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
4.	.1mfd	High side to pin 7 (grid) of converter. Low side to chassis.	455KC (400∿ Mod)	AM	Tuning gang fully open	Across voice coil	A7, A8, A9, A10	Adjust for maximum output.

FM RF ALIGNMENT

Coils not containing adjustable cores are adjusted by expanding or compressing coil turns.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
5.	Two 150Ω Carbon Resistors	Across FM antenna terminals with 150Ω in each lead.	88MC (30% FM Mod)	FM	88MC	Across voice coil	L4	Adjust for maximum output.
6.	"	"	108MC	"	108MC	"	All	Adjust for maximum output. Repeat steps 5 and 6.
7.	"	"	98MC	"	98MC	"	L1, A12	Adjust for maximum output.

AM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
8.		Loop	1500KC (400∿ Mod)	AM	1500KC on dial	Across voice coil	A13, A14	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
9.		"	600KC	"	600KC signal	"		Check for proper tracking.

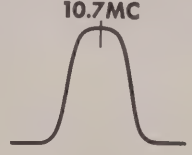


FIG. 1

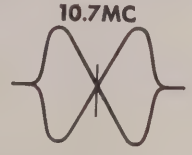
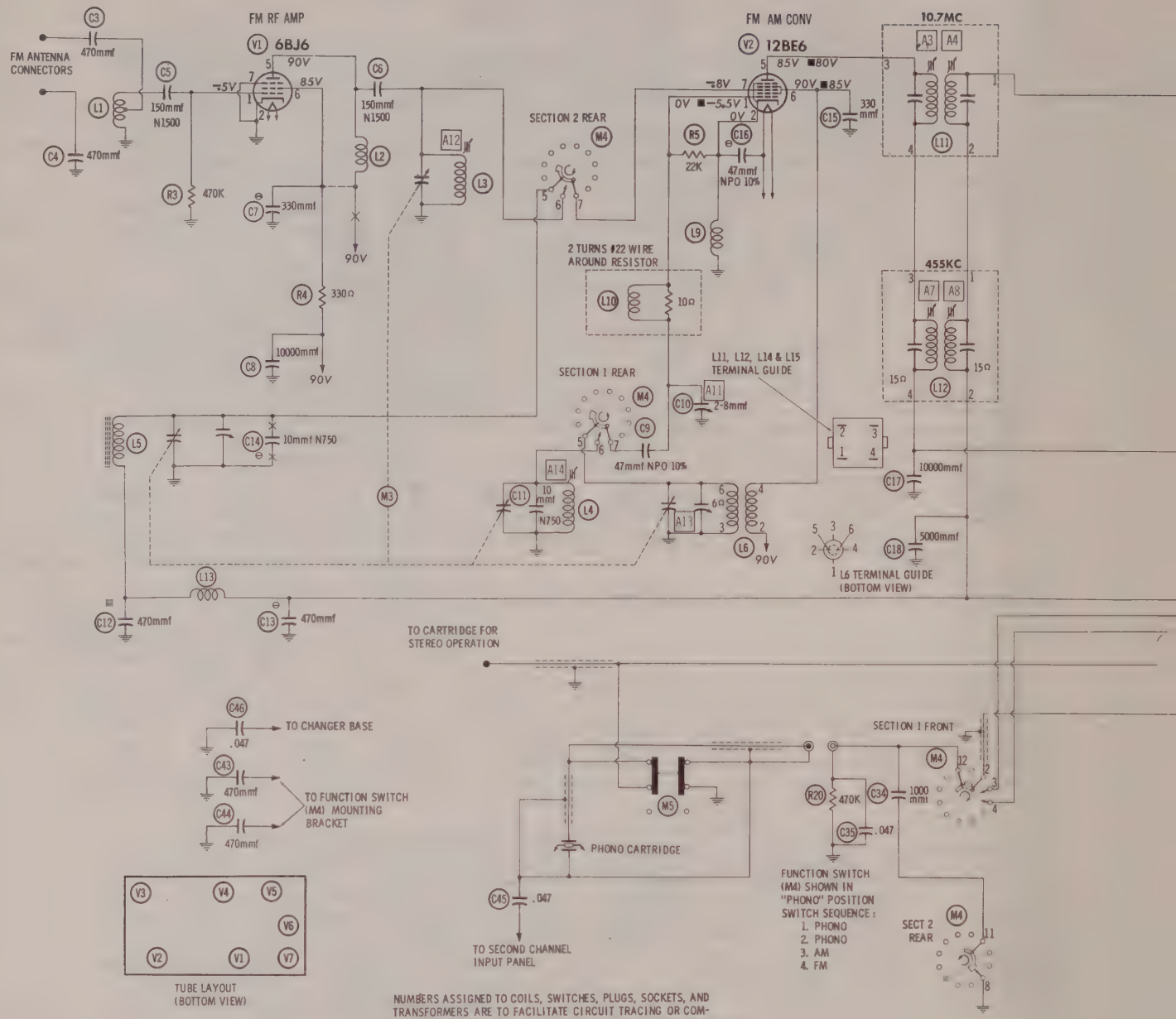


FIG. 2



NUMBERS ASSIGNED TO COILS, SWITCHES, PLUGS, SOCKETS, AND TRANSFORMERS ARE TO FACILITATE CIRCUIT TRACING OR COMPONENT REPLACEMENT AND MAY NOT NECESSARILY BE FOUND ON THE UNIT.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BJ6	470K	0Ω	55Ω	49Ω	†480Ω	†810Ω	0Ω		
V2	12BE6	22K	.4Ω	31Ω	19Ω	†1800Ω	†480Ω	0Ω - 2.7meg		
V3	6BJ6	300K - 2.7meg	0Ω	37Ω	31Ω	†480Ω	†1500Ω	0Ω		
V4	12AU6	470K	0Ω	37Ω	49Ω	†10K	†10K	0Ω		
V5	19T8	1.3meg	22K	1.3meg	0Ω	19Ω	470K	0Ω	6.8meg	†470K
V6	35C5	150Ω	470K	90Ω	55Ω	470K	†480Ω	†200Ω		
V7	35W4	TP	NC	90Ω	125Ω	125Ω	115Ω	¶		

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.
¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
† MEASURED FROM PIN 7 OF V7.
- MEASURED IN "AM" POSITION.
NC NO CONNECTION.
TP TIE POINT.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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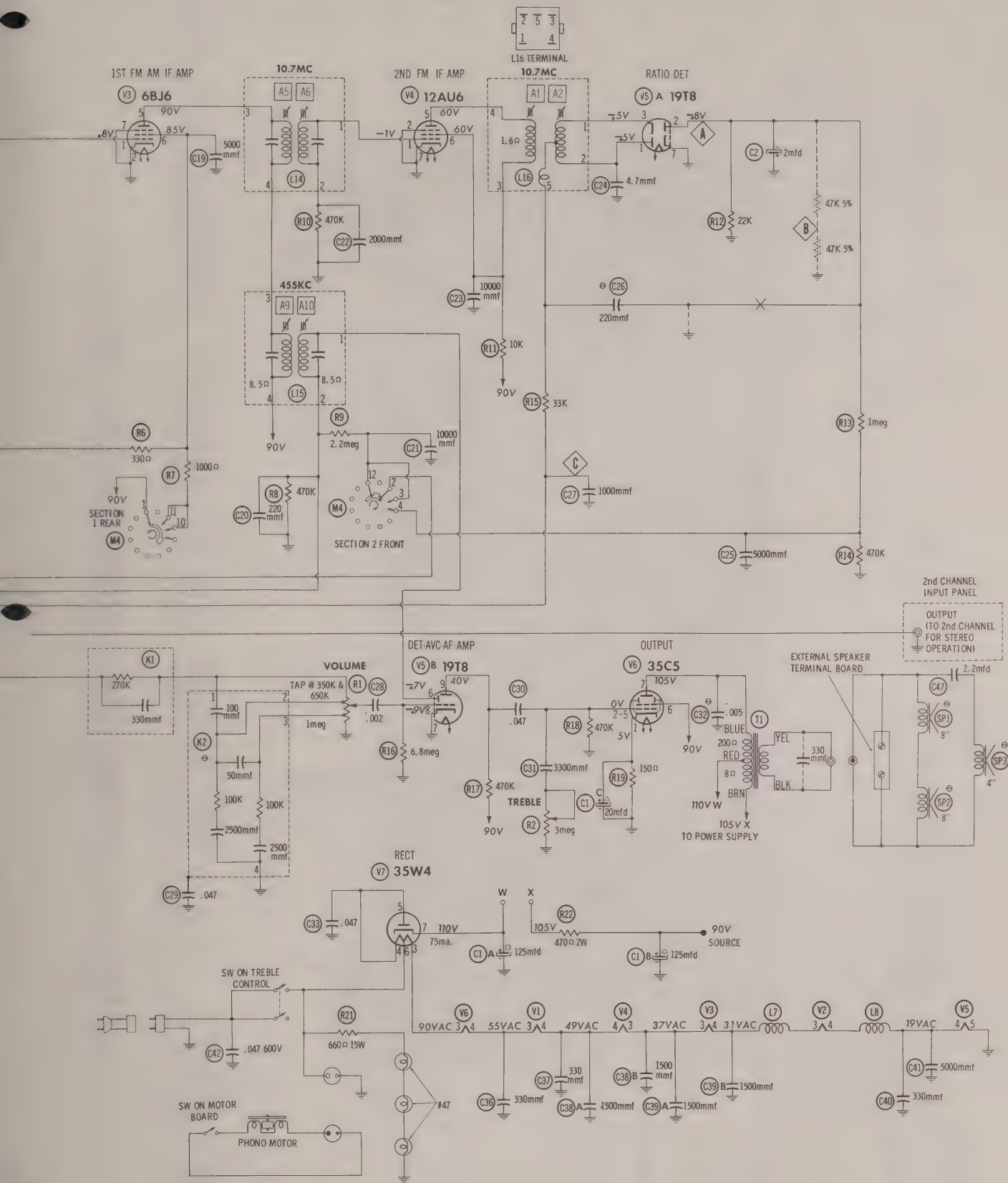
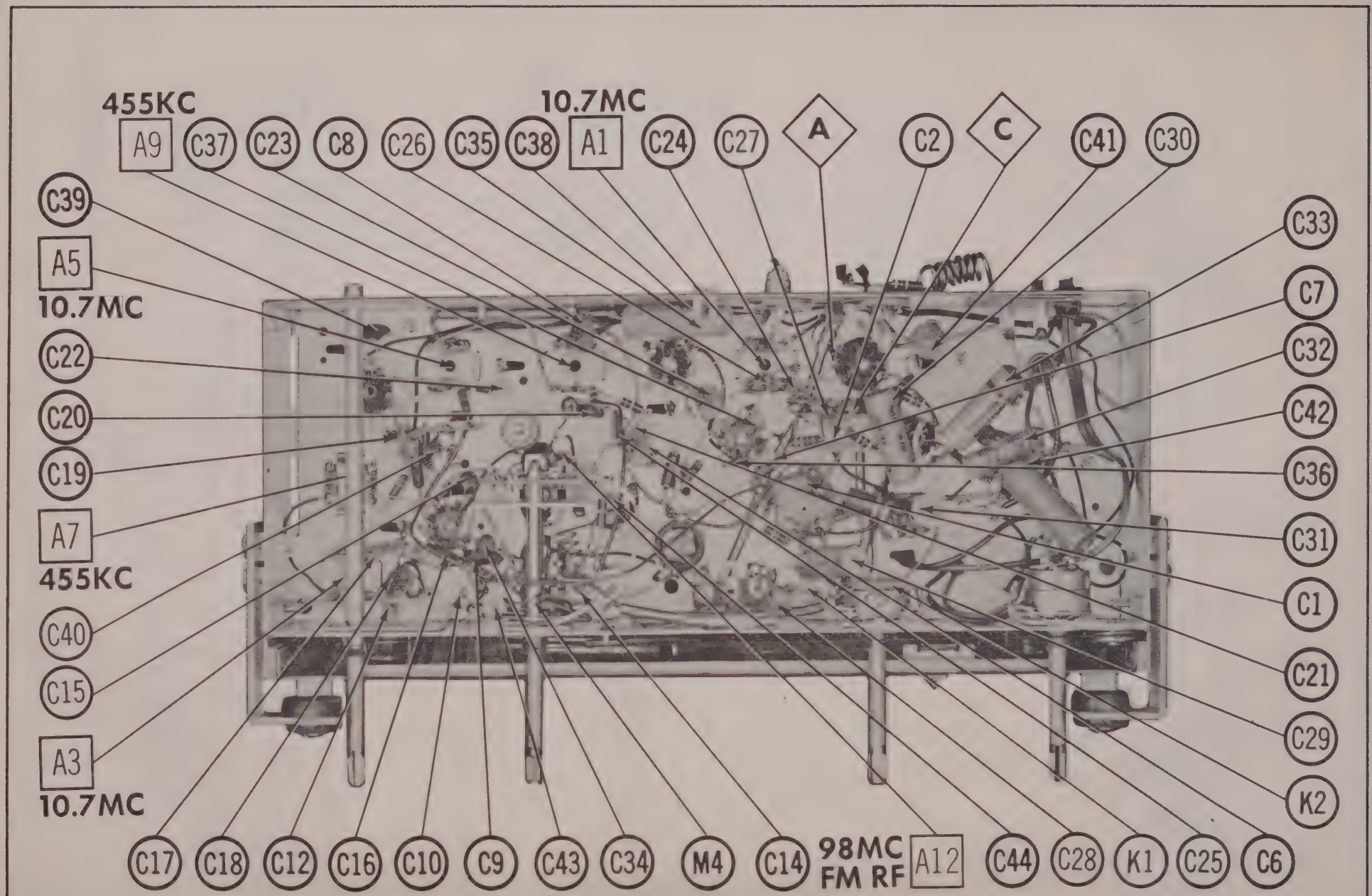


OLYMPIC MODELS
A590, 589, 689M



CHASSIS BOTTOM VIEW - ALIGNMENT, CAPACITOR, & MISC IDENT

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	FM RF Amplifier	6BJ6	
V2	FM-AM Converter	12BE6	
V3	1st FM-AM IF Amp.	6BJ6	
V4	2nd FM IF Amp.	12AU6	

ITEM No.	USE	TYPE	NOTES
V5	Ratio Det. -AM Det. - AVC - AF Amp.	19T8	
V6	Output	35C5	
V7	Rectifier	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	OLYMPIC PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	
C1A	▣125	150	CO-4032	AFH3-13-30	XCO126	FP311.9		TVL-3448.2	
B	▣125	150							
C	▲20	25							
C2	2	50	CO-4033	PRS50V2	BBR2-50	TC302	TD-2-50	TVA-1301	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	OLYMPIC PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	470			CCD471X	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C4	470			CCD471X	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C5	150		N1500							
C6	150		N1500							
C7	330			CCD331M	BPD-00033	DD-331	L10T33	B-333	5GA-T33	①
C8	10000			CCD103X	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C9	47		NPO 10%	CCD470K	NPO-DI 47	DTZ-47	C10Q47C	CNO-447	5TCC-Q47S 10% *	
C10	2-8			CT1036		829-10				
C11	10		N750		N750-DI 10	DTN-10	C10Q1U	CN7-410	5TCU-Q1S 10% *	
C12	470			CCD471X	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	②
C13	470			CCD471X	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	②
C14	10		N750		N750-DI 10	DTN-10	C10Q1U	CN7-410	5TCU-Q47S 10% *	③
C15	330			CCD331M	BPD-00033	DD-331	L10T33	B-333	5GA-T33	
C16	47		NPO 10%	CCD470K	NPO-DI 47	DTZ-47	C10Q47C	CNO-447	5TCC-Q47S 10% *	④
C17	10000			CCD103X	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C18	5000			CCD502X	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C19	5000			CCD502X	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C20	220			CCD221M	BPD-00022	DD-221	L10T22	B-322	5GA-T22	
C21	10000			CCD103X	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C22	2000			CCD202X	BPD-002	DD-202	BYA10D2	B-220	5HK-D2	
C23	10000			CCD103X	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C24	4.7			CO-1083		TCZ-4R7	C10V47C	ZT-5547	5GA-V5	
C25	5000			CCD502X	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C26	220			CCD221M	BPD-00022	DD-221	L10T22	B-322	5GA-T22	⑤
C27	1000			CCD102M	BPD-001	DD-102	BYA10D1M	B-210	5HK-D1	
C28	.002	400		CO-H-4202	P488N-002	D6-202	CUB6D2	GEM-622	6TM-D2	
C29	.047	400		CO-H-4473	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C30	.047	400		CO-H-4473	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C31	3300			CCD332M	BPD-0033	DD-332	BYA10D33	B-233	5HK-D33	
C32	.005	400		CO-H-4502	P488N-005	D6-502	CUB6D5	GEM-625	6TM-D5	⑥
C33	.047	400		CO-H-4473	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C34	1000			CCD102M	BPD-001	DD-102	BYA10D1M	B-210	5HK-D1	
C35	.047	400		CO-H-4473	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C36	330			CCD331M	BPD-00033	DD-331	L10T33	B-333	5GA-T33	
C37	330			CCD331M	BPD-00033	DD-331	L10T33	B-333	5GA-T33	
C38A	1500			CC2D-152X	BPD-2X0015	DD3-152	BYC6DD15	B-215	5HK-2D15	
B	1500							B-215		

CAPACITORS (cont)

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	OLYMPIC PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C39A	1500			CC2D-152X	BPD-2X0015	DD3-152	BYC6DD15	B-215	5HK-2D15	
B	1500							B-215		
C40	330			CCD331M	BPD-00033	DD-331	L10T33	B-333	5GA-T33	
C41	5000			CCD502X	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C42	.047	600		CO-B-6473	P688N-047	DF-503	CUB6S47	GEM-6147	6TM-S47	
C43	470			CCD471X	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C44	470			CCD471X	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C45	.047	400		CO-H-4473	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C46	.047	400		CO-H-4473	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C47	2.2	3								

① Some versions may use 470mmf in this application (Part #CCD471X).
② Some versions may use 330mmf in this application (Part #CCD331M).
③ Not used in some versions.
④ Some versions may use 150mmf in this application (Part #CCD151X).
⑤ Some versions may use 470mmf (Part #CCD471X) or 330mmf (Part #CCD331M) in this application.
⑥ Some versions may use .002mfd @ 400V in this application (Part #CO-H-4202).
* Not normally in distributor's stock. Available through distributor on order to manufacturer.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	OLYMPIC PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	1meg	½	PT2542I	*C1-70		Q18-137XX	UDT-289	Volume, taps @ 350K, 650K①
R2A	3meg	½	PT-2160	B-85	A47-3meg-Z	Q13-140	U-57	Treble
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
C	Switch			KB-3	SWE-21	76-2	US-28	Off-On

① Some versions may use 1meg Volume, including K2 (Part #PT-4061). * Includes K2.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		OLYMPIC PART No.	NOTES
	OHMS	WATT		
R3	470K		REB474M	
R4	330Ω		REB331M	
R5	22K		REB223M	
R6	330Ω		REB331M	
R7	1000Ω		REB102M	
R8	470K		REB474M	
R9	2.2meg		REB225M	
R10	470K		REB474M	
R11	10K		REB103M	
R12	22K		REB223M	

ITEM No.	RATING		OLYMPIC PART No.	NOTES
	OHMS	WATT		
R13	1meg		REB105M	
R14	470K		REB474M	
R15	33K		REB333M	
R16	6.8meg		REB685M	
R17	470K		REB474M	
R18	470K		REB474M	
R19	150Ω		REB151K	
R20	470K		REB474M	
R21	660Ω	15	RE25411	
R22	470Ω	2	RED471M	

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	OLYMPIC PART No.	REPLACEMENT DATA	
K1	Volume Control Coupling	330mmf, 270K	PC5647	Aerovox Centralab	PA-432 PC-61
K2	Volume Control Comp.	50mmf, 100mmf, 2500mmf, 2500mmf, 100K, 100K	(Part of R1)	Centralab Sprague	PC-325 TC-5

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA						NOTES
		OLYMPIC PART No.	Gramer PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	FM Ant. Coil	CL2178						
L2	RF Choke	CK5742						3.3uh
L3	FM RF Coil	CL4035						
L4	FM Osc. Coil	CL4036						
L5	Loopstick	LP5513						
L6	AM Osc. Coil	CL1486	14-1074	14-1074	BC-397 *	5480 *		
L7	Fil. Choke	CK2445	19-1002	19-1002	BC-563	4606		2.2uh
L8	Fil. Choke	CK2445	19-1002	19-1002	BC-563	4606		2.2uh
L9	Cathode Choke	CK2447	19-2005	19-2005		4588		.47uh ①
L10	RF Choke							②
L11	1st FM IF	TR1643	16-3487	16-3487	FM-254	1463		
L12	1st AM IF	TR1644	16-6758	16-6758	BC-352	12-C1	RF-1	
L13	RF Choke	CK2445	19-1002	19-1002	BC-563	4606		2.2uh
L14	2nd FM IF	TR1643	16-3487	16-3487	FM-254	1463		
L15	2nd AM IF	TR1645	16-6758	16-6758	BC-353	12-C2	RF-2	
L16	Ratio Detector	TR1646	17-3498	17-3498	FM-255	1465		

① IRC Part #CLA. * Drill mounting hole.
② Two turns #22 wire wound on 10Ω resistor.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	OLYMPIC PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2400Ω tap @ 3%	3-4Ω	TR-2690-1	24S50A ①	A-3031 ①		A-3330 ①	24S50A ①	S-16X ①	① Drill new mounting hole.

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	OLYMPIC PART No.	QUAM PART No.	
SP1	8"	PM	3-4Ω	SK1906 ①	8A31	① Models 589, 689M
SP2	8"	PM	3-4Ω	SK1906-2 ①	8A31	② Used in all models.
SP3	4"	PM	3-4Ω	SK4342 ②	4A07	③ Model A590
	6" x 9"	PM		SK5738 ③		
	3"	PM		SK4076-1 ③		

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA							REMARKS
	OLYMPIC PART No.	ASTATIC PART No.		ELECTRO-VOICE PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1		81-TB *				2	CRA-55 † or CRA-55D ♦ & CRA-55LP † or CRA-55LPD ♦	† Jewel ♦ Diamond * Includes needles & mtg. mech.

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	OLYMPIC PART No.	JENSEN PART No.	WALCO PART No.	
M2		CRA-55 † or CRA-55D ♦ & CRA-55LP † or CRA-55LPD ♦	W64S † or W64D ♦ & W64MGS † or W64MGD ♦	† Jewel ♦ Diamond

MISCELLANEOUS

ITEM No.	PART NAME	OLYMPIC PART No.	NOTES
M3	Tuning Cap.	CV2165	4 Gang (AM Sections: Ant. 29-525mmf, Osc. 22-195mmf)
M4	Switch	SW4017	Function, (Rotary Type)
M5	Switch		Mono-Stereo (DPDT, Slide Type)

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	KN3870	Tuning (Mahogany)
Knob	KN3870-1	Tuning (Tan)
Knob	KN3869	Volume (Mahogany)
Knob	KN3869-1	Volume (Tan)
Knob	KN3872	Off-On, Tone (Mahogany)
Knob	KN3872-1	Off-On, Tone (Tan)
Knob	KN3873	FM-AM-Phono (Mahogany)
Knob	KN3873-1	FM-AM-Phono (Tan)
Pointer	PO1011	
Dial Glass	DL5235	

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors
Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting) ..... Use BELDEN No. 8401
Phono Pick-up Arm Cable ..... Use BELDEN No. 8430 (Two Conductor - Twisted)

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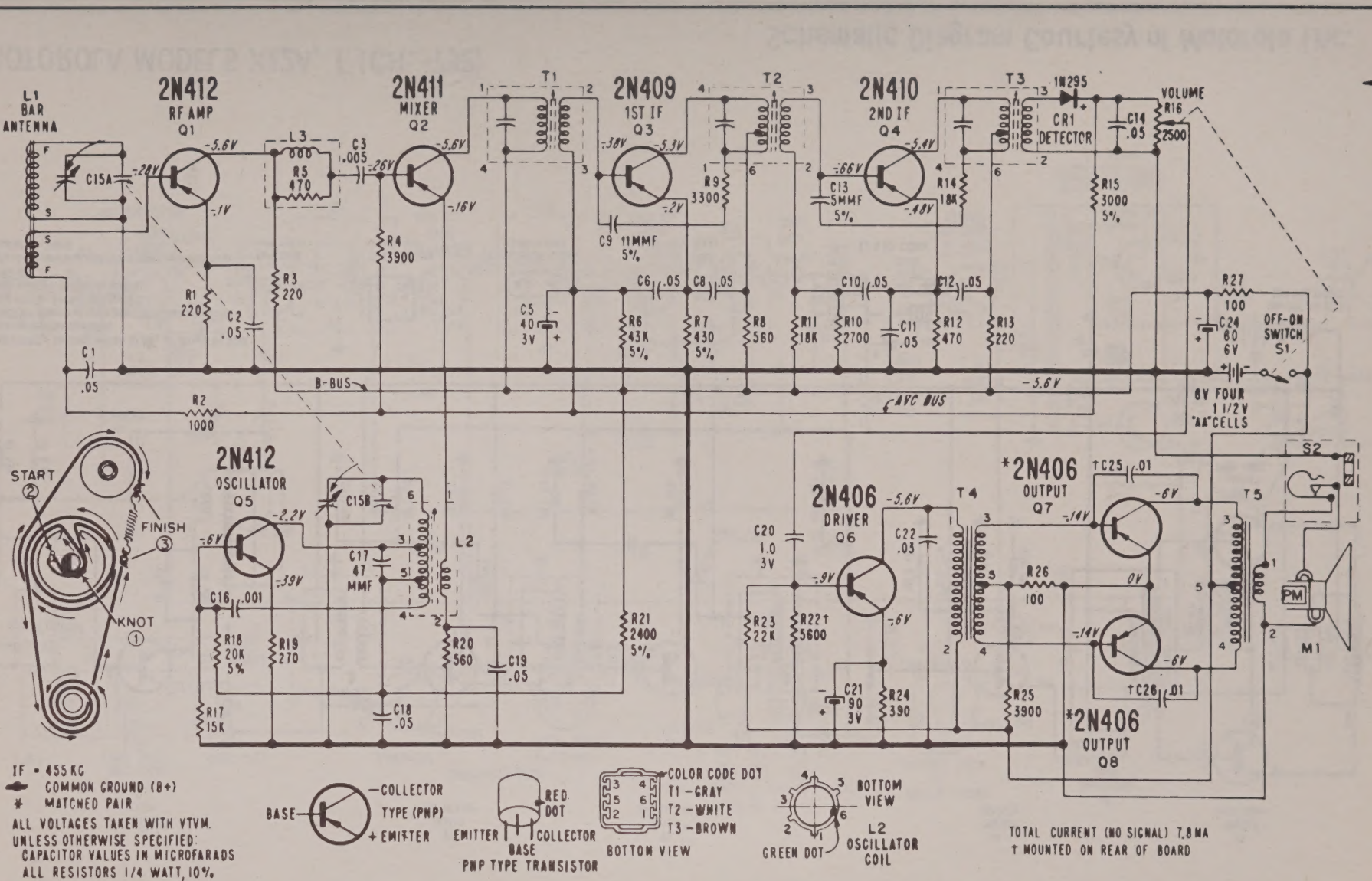
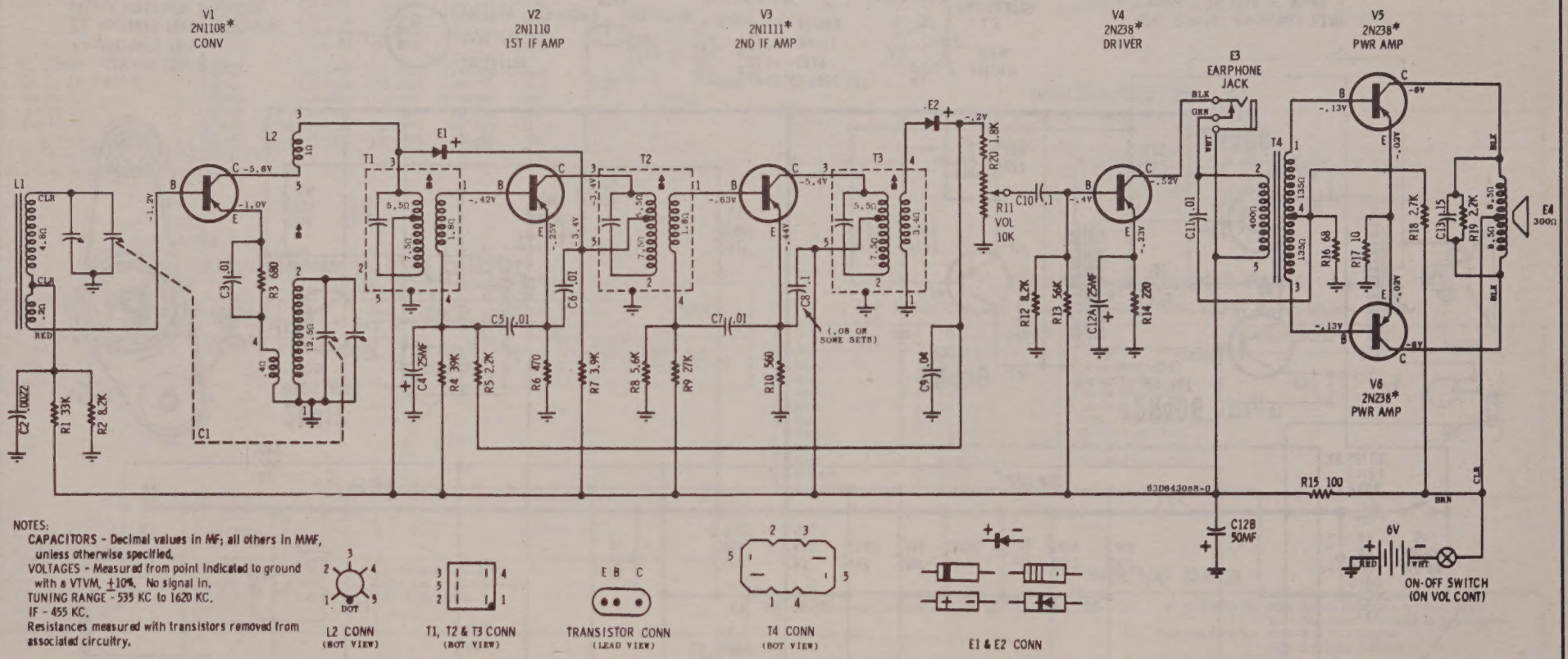


ADMIRAL MODELS 711, 717 (CH. 8T1)

Schematic Diagram Courtesy of Admiral Corp.



NOTES:
CAPACITORS - Decimal values in MF; all others in MMF, unless otherwise specified.
VOLTAGES - Measured from point indicated to ground with a VTVM, ±10%. No signal in.
TUNING RANGE - 535 KC to 1620 KC.
IF - 455 KC.
Resistances measured with transistors removed from associated circuitry.

L2 CONN
(BOT VIEW)

T1, T2 & T3 CONN
(BOT VIEW)

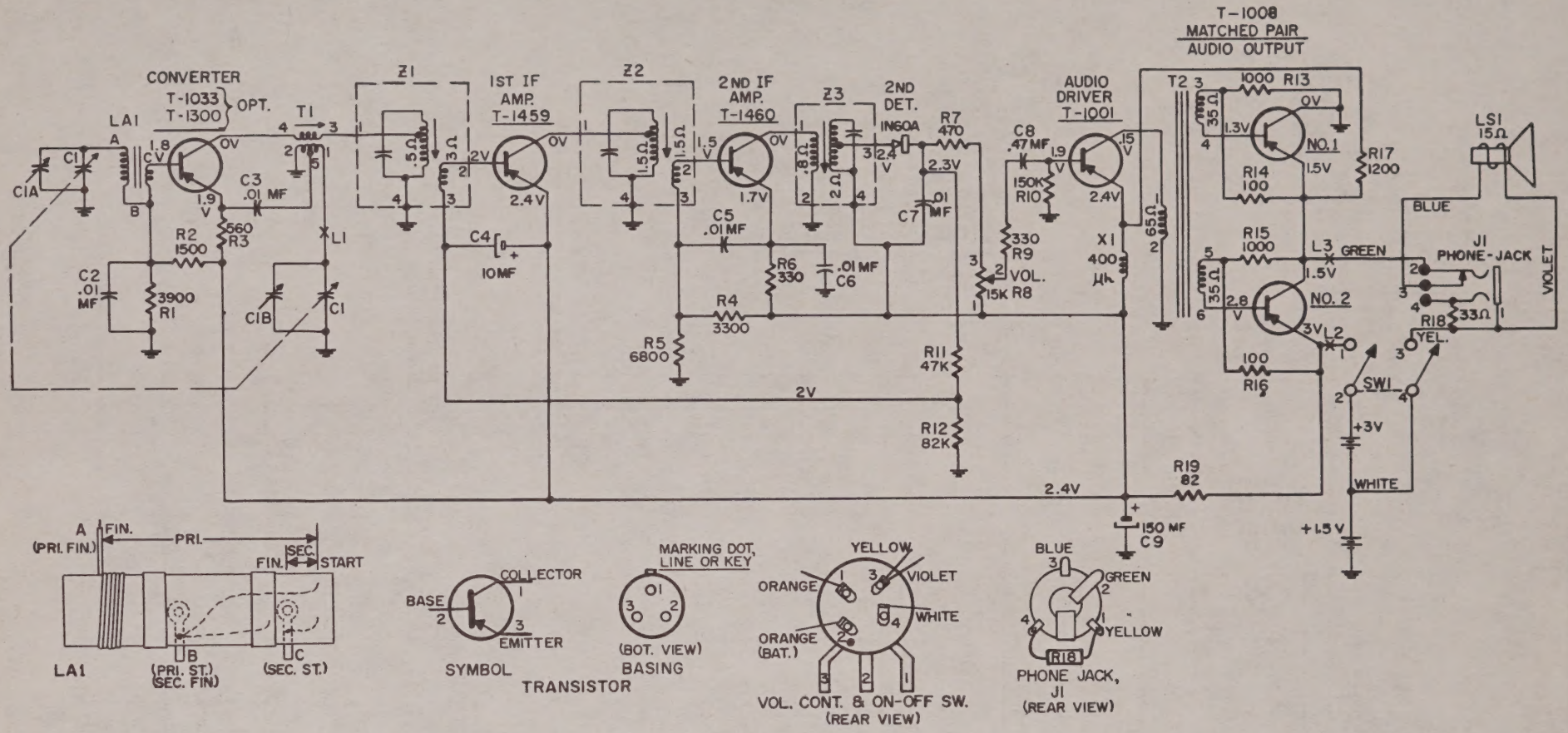
TRANSISTOR CONN
(LEAD VIEW)

T4 CONN
(BOT VIEW)

E1 & E2 CONN

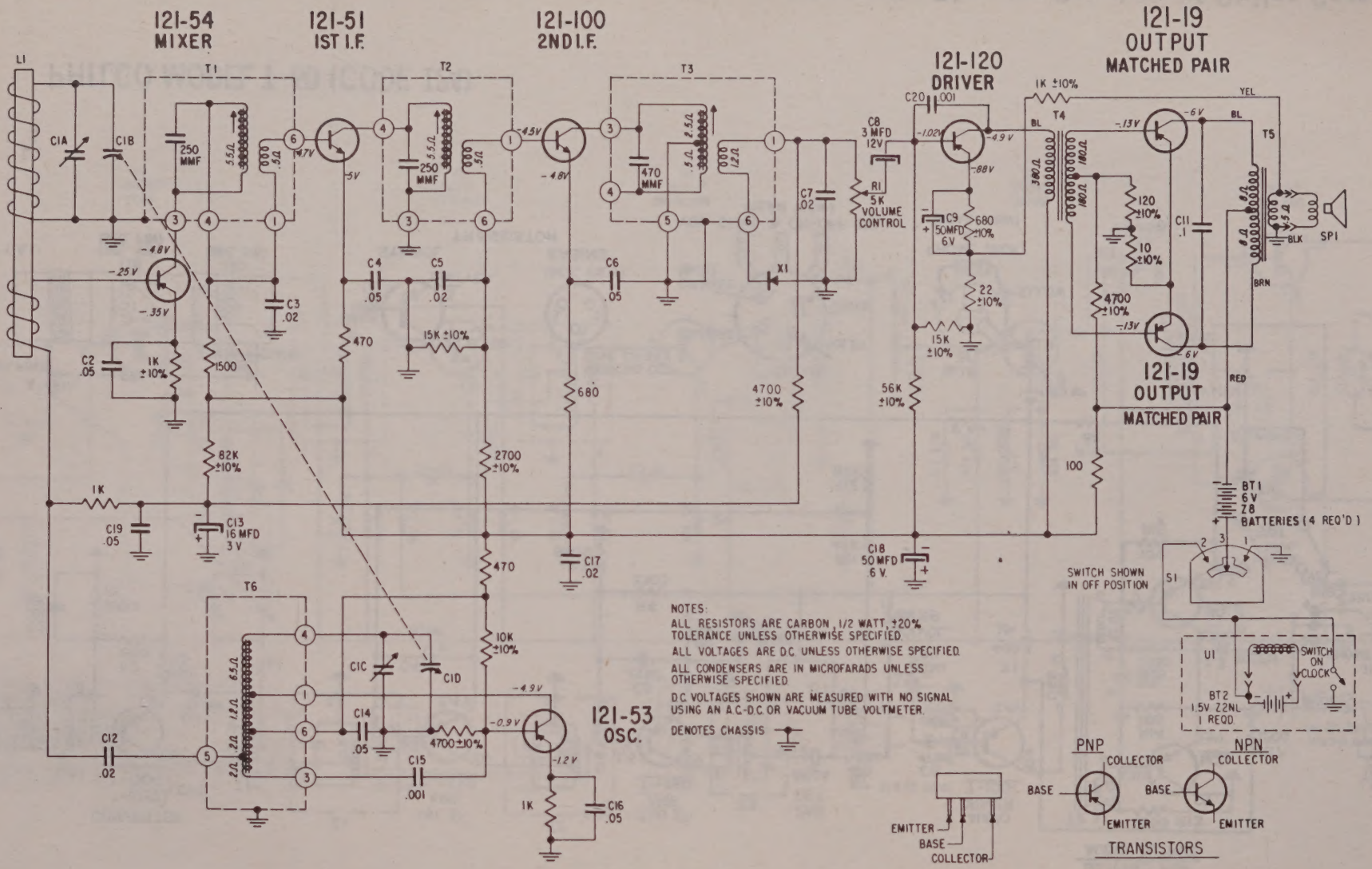
MOTOROLA MODELS X12A, E (CH. -732)

Schematic Diagram Courtesy of Motorola Inc.



PHILCO MODEL T-60 (CODE 124)

Schematic Diagram Courtesy of Philco Corp.



ZENITH MODEL "ROYAL 950" (CH. 7AT46Z1)

Schematic Diagram Courtesy of Zenith Radio Corp.